Dell Training for Desktop Systems

Welcome

This course introduces Dell desktops. Based on the current Dell offering, it describes the features and components of Dell desktops and the use of the Basic Input Output System (BIOS) program. It also provides and overview of basic troubleshooting procedures and provides component-specific troubleshooting methodologies.

After completing this course, you will be able to:

- Describe the features and components of Dell desktops for the OptiPlex, Vostro, and Precision families
- Define and use the BIOS program
- Identify and use Dell desktop chassis' diagnostic feature sets and tools for troubleshooting
- Follow sound troubleshooting processes for Dell desktops

Course Contents

The following modules comprise this course:

1. **Dell Desktop Chassis Awareness**: Describes the various models in the Dell Desktop family. Topics include:
   - Dell OptiPlex chassis awareness
   - Dell Vostro chassis awareness
   - Dell Precision chassis awareness

2. **The BIOS**: Describes the BIOS and its role, and outlines the steps in the boot process.

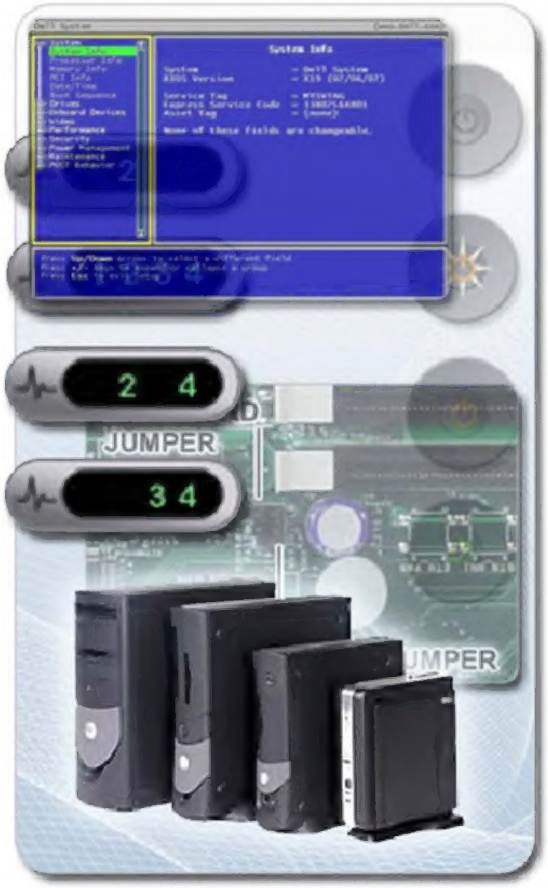
3. **Diagnostics**: Provides an overview of the diagnostic feature set and provides information about the various Dell diagnostic tools and their uses.

4. **Issue Identification**: Provides an introduction to the troubleshooting process, including basic information for identifying and tracking systems that will be serviced and how to begin isolating faults.

5. **Troubleshooting**: Describes troubleshooting procedures for various types of faults, including:
   - Power
   - Pre-POST
   - POST
   - System activity subsequent to video initialization
   - Display issues

6. **Assessment**: Provides an opportunity for you to demonstrate your mastery of the course objectives. To receive credit for this course, you must pass the exit assessment with a score of 80% or higher.

7. **Conclusion**: Identifies the next steps for continuing your training.



Additional Information

- This course should take 2 hours to complete (excluding the assessment).
- Depending on your firewall, if you leave the course before completing, you will either be given the option to return to the beginning of the course or to go back to where you left the course.
- If you would like to go straight to the assessment, you can. Choose the menu icon in the lower-left corner of the screen. When the menu is open, select "Module 6" on the left side.
- For additional technical information, you can refer to support.dell.com.
- Click **Forward** to begin.

Safety Guidelines

You must take precautions to prevent electrostatic discharge (ESD).

Static electricity - A charge stored in any body.

Electrostatic discharge - A sudden transfer of electrostatic charge between bodies at different electrostatic potential–usually as a spark as the bodies approach one another.

ESD is a major concern when handling components, especially expansion cards and system boards. Very slight charges can damage circuits. Damage from ESD can occur immediately or it may not become apparent for some time. ESD may also result in intermittent problems or a shortened product lifespan.

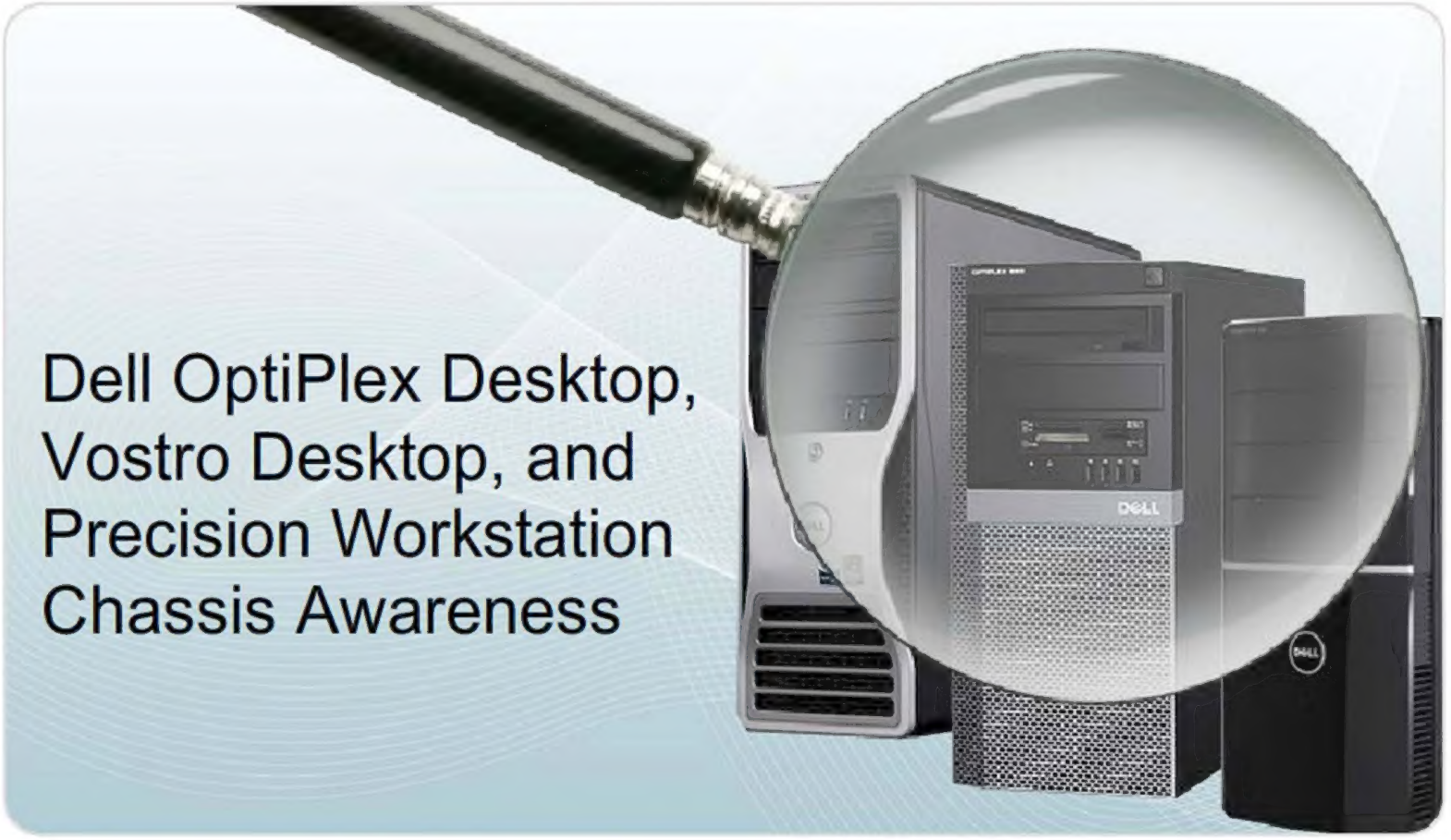
You can minimize the chances of a discharge by wearing the wrist-grounding strap that comes in the ESD kit and taking several precautions:

- While the system is plugged into the earth circuit via the power socket, attach the wrist-grounding strap to your wrist and clip the other end to a ground object. If a wrist-grounding strap is not available, you can discharge the static electricity in your body by touching an unpainted metal surface, such as the system chassis.
- Unplug the machine.

Static-sensitive components arrive wrapped in anti-static packing material. Do the following when handling static-sensitive components:

- Use an ESD wrist-grounding strap.
- Handle all sensitive components in a static-safe area.
- If possible, use anti-static floor mats and workbench pads.
- When unpacking a static-sensitive component, do not remove the component from the anti-static packing material until you are ready to install the components into your system.

Dell OptiPlex Desktop, Vostro Desktop, and Precision Workstation Chassis Awareness



Objectives

This topic explores the general features of a Dell desktop chassis and identifies the current major Dell desktop families.

After completing this topic, you will be able to identify OptiPlex desktop, Precision workstation, and Vostro desktop chassis features and identify the diagnostic features of Dell desktop chassis.

Identifying the Dell Chassis

It is advised that you confirm the type and look of the system chassis you are troubleshooting before employing any strategy or methodology, because:

- You may need to account for subtle differences.
- Different chassis types are typically comprised of different parts.

The chassis type can be identified by referring to the online system manual, which includes pictures, making a visual confirmation possible.

Note: Despite the differences between chassis types, the methods of troubleshooting and the principles and practice of opening the chassis are fundamentally the same.

What Are the Features of the Dell Chassis?

Dell Desktop chassis are designed to make troubleshooting simple. Click each image to learn more about the key features:

Note: Together, these features simplify service delivery. You may find it easier to request the parts and install them yourself rather than wait for an onsite technician. You can find step-by-step instructions in the online *User's Manual* or *Service Manual*.

Safe, intuitive hardware access:

- You can open many Dell chassis without tools.
- Some chassis do require a screwdriver to remove the screws that secure the cover to the main body of the chassis.

What Are the Features of the Dell Chassis?

Dell Desktop chassis are designed to make troubleshooting simple. Click each image to learn more about the key features:

Note: Together, these features simplify service delivery. You may find it easier to request the parts and install them yourself rather than wait for an onsite technician. You can find step-by-step instructions in the online *User's Manual* or *Service Manual*.

Maintainability and serviceability:

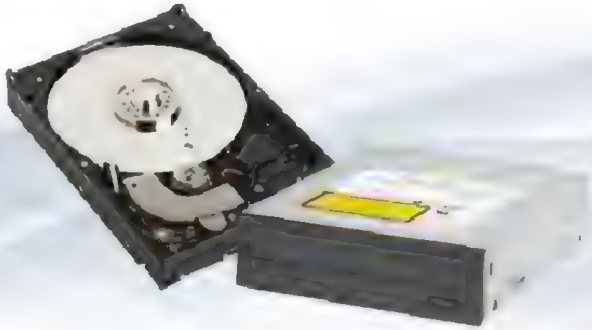
- The hard drives, CD, DVD, and tape drives of many systems are mounted on rails. You do not need any tools to remove drives from these systems. You do need a screwdriver to remove the drives from the rails.
- You can easily remove and reseat the data cables on IDE and SATA drives.
- You can easily remove and reseat memory modules, which are secured by two plastic levers.

Note that replacement drives do not ship with mounting rails. You must transfer the rails from the existing drive.

What Are the Features of the Dell Chassis?

Dell Desktop chassis are designed to make troubleshooting simple. Click each image to learn more about the key features:

Note: Together, these features simplify service delivery. You may find it easier to request the parts and install them yourself rather than wait for an onsite technician. You can find step-by-step instructions in the online *User's Manual* or *Service Manual*.



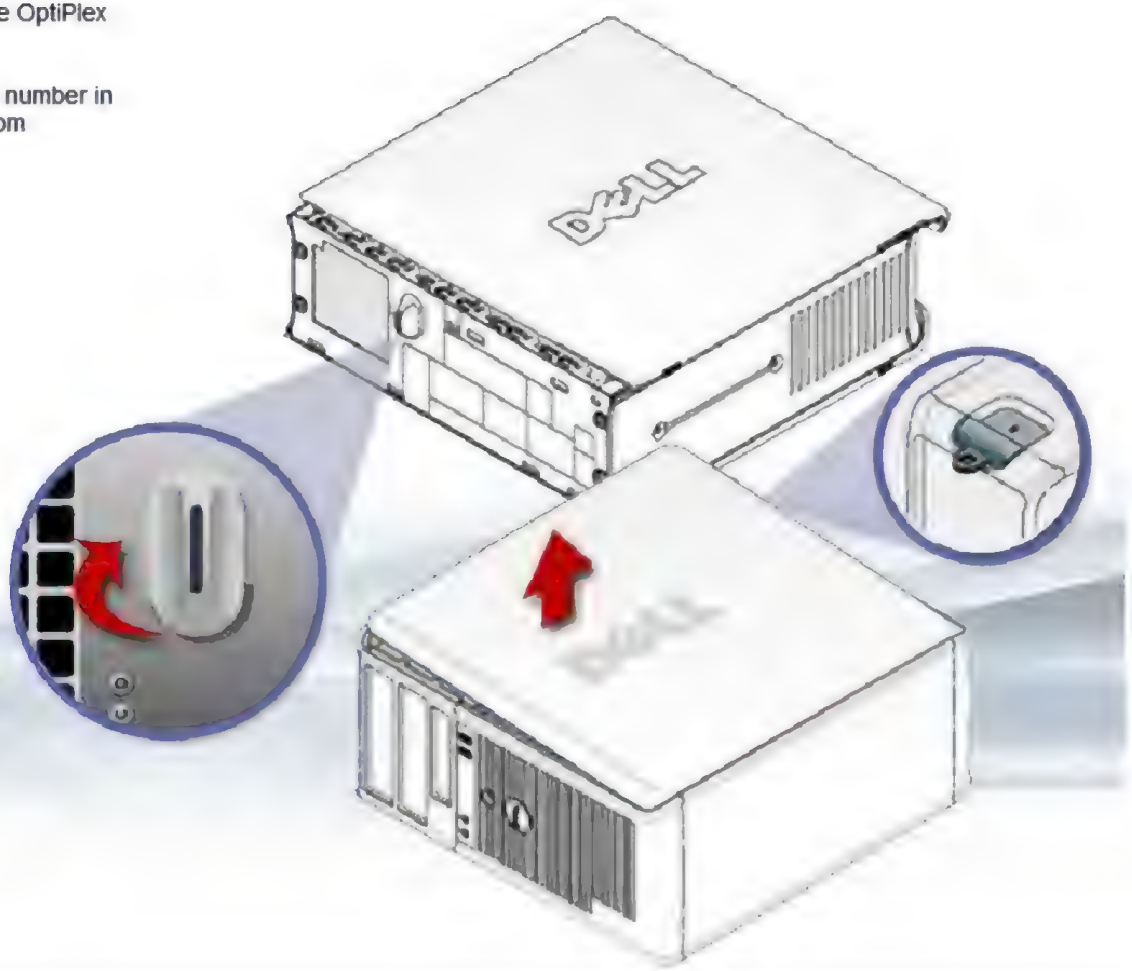
Color coding:

- Components are often color-coded.
- Blue plastic indicates a customer-removable unit (CRU). Older systems used green plastic to indicate CRUs.
- Blue SATA cables connect to the hard drive, while orange SATA cables connect to the optical drive. The blue and orange color coding also refer to the pull tabs on the IDE cables

Opening the Dell Chassis

The method for opening a chassis varies by model. For example, some OptiPlex models just require the user to slide or turn a handle.

Note: You can find details for opening chassis types by system model number in the manual for the system, which can be located on the support.dell.com Documentation page.



Opening an Ultra-Small Form Factor Chassis

The Ultra-Small Form Factor has a plastic back assembly.

First, you need to remove the assembly, which has two parts.

Then, you can open the side panel by turning the button on the chassis.

The button locking mechanism on the Ultra-Small Form Factor is always located at the back of the system.

Knowledge Check

What color are the plastics that indicate a CRU? (Check all that apply)

Make your selection, and click **DONE** when you are finished.

- (A) Blue
- (B) Green
- (C) White
- (D) Yellow

Correct!

DONE RESET

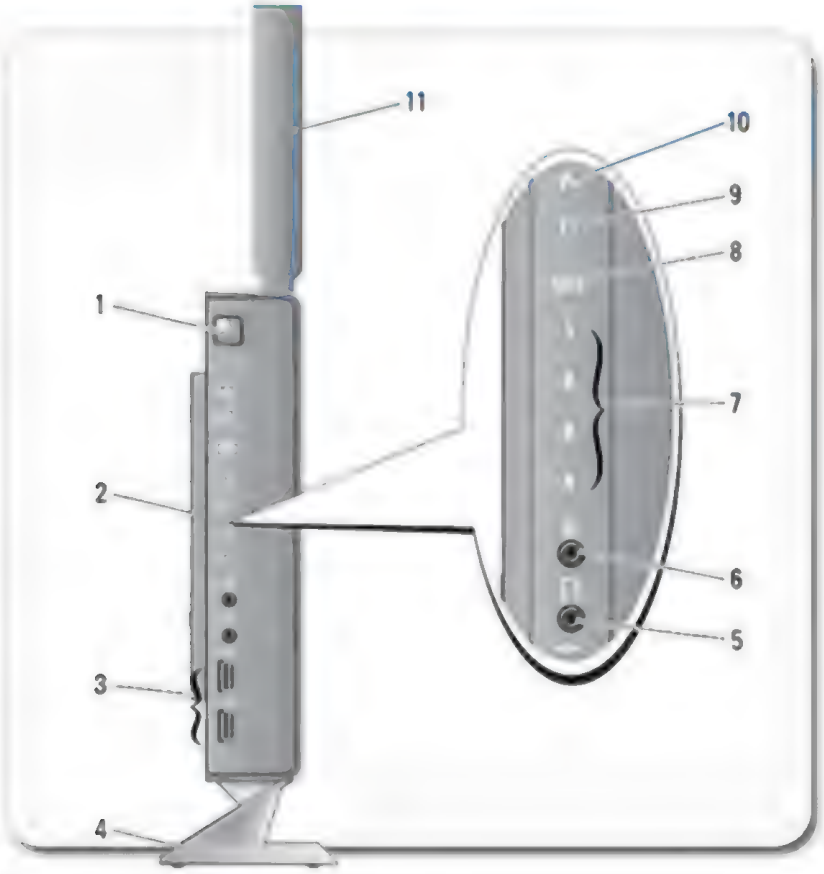
Dell OptiPlex Chassis Awareness

Objectives

We will examine three recent OptiPlex models in this course. There are many other OptiPlex models and further information can be found at support.dell.com in the *Service Manuals*.

After completing this topic, you will be able to differentiate among the OptiPlex desktop models, idenfity chassis features for all OptiPlex desktop models, and locate diagnostic chassis features. This module also lists form factors for each member of the OptiPlex desktop line-up.

OptiPlex 160 Front and Back Views



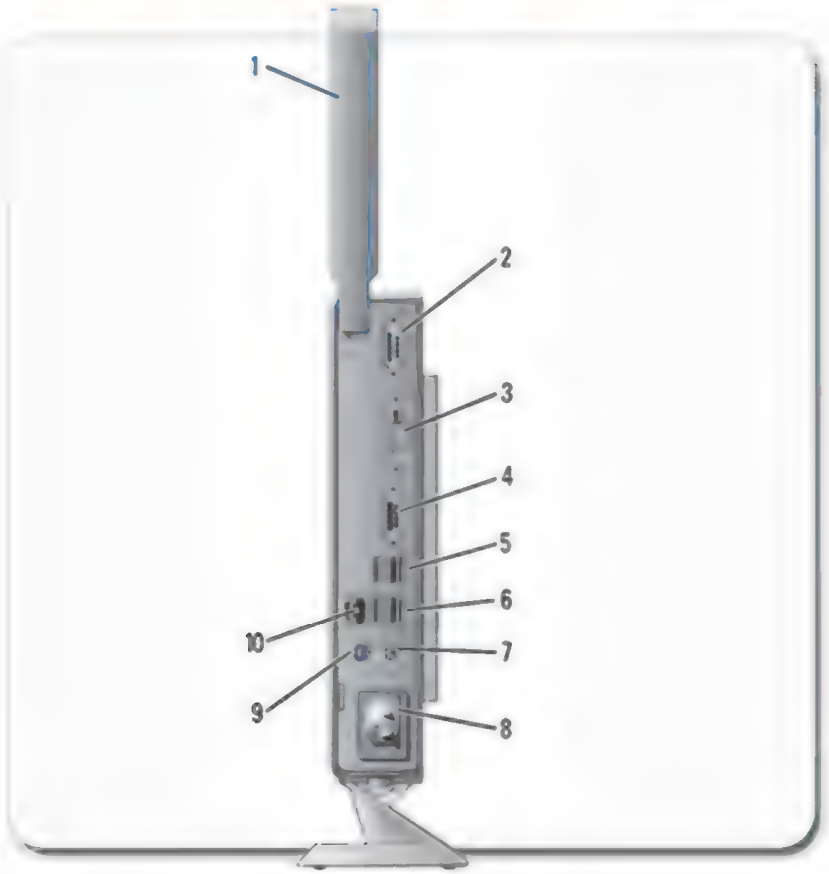
The OptiPlex 160 chassis has several standard features.

Click the ***Forward*** button to learn more.

Front view:

1. Power button
2. Side cover (label cover)
3. USB connectors (2)
4. Stand
5. Headphone connector
6. Microphone connector
7. Diagnostic LEDs
8. WiFi indicator
9. Hard drive indicator
10. Network activity indicator
11. Wireless antenna (optional)

OptiPlex 160 Front and Back Views



The OptiPlex 160 chassis has several standard features.

Click the ***Forward*** button to learn more.

Back view:

1. Wireless antenna (optional)
2. Serial connector
3. DVI connector
4. VGA connector
5. USB 2.0 connectors (2)
6. USB 2.0 connectors (2) for selective USB
7. PS/2 keyboard connector
8. Power connector
9. PS/2 mouse connector
10. Network connector (RJ-45)

OptiPlex 780 Form Factors

The OptiPlex 780 is available in four form factors.

Click the ***Forward*** button to learn more.

- Mini-Tower (MT)
- Desktop (DT)
- Small Form Factor (SFF)
- Ultra-Small-Form Factor (USFF)

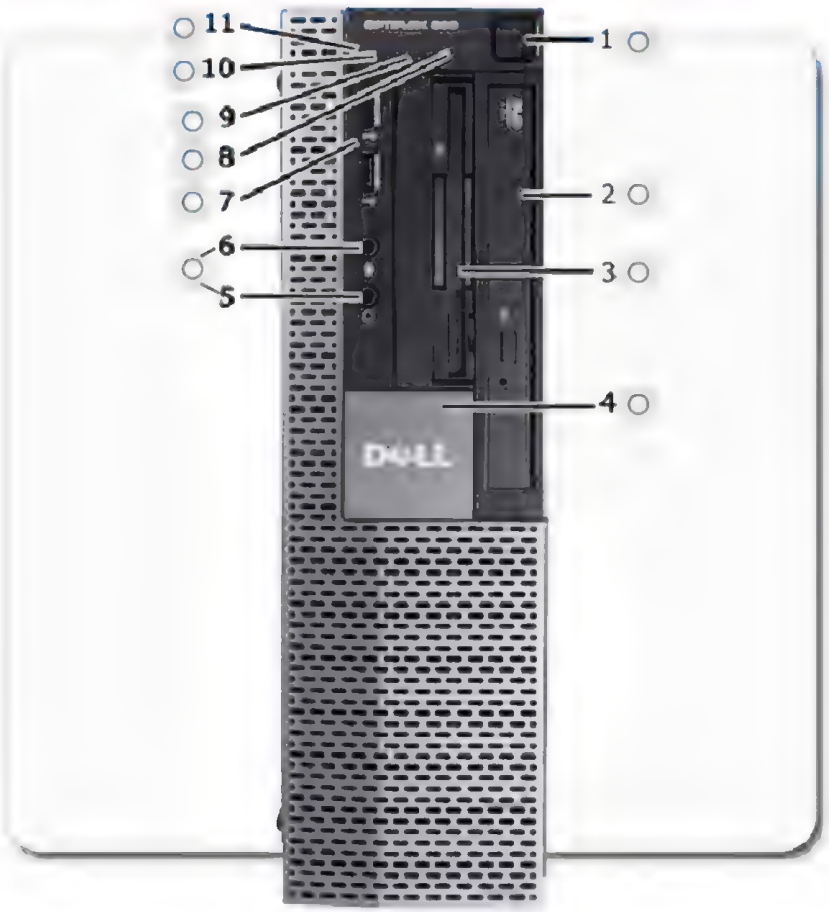
OptiPlex 960

The OptiPlex 960 is available in three form factors.

Click the ***Forward*** button to learn more.

- Mini-Tower (MT)
- Desktop (DT)
- Small Form Factor (SFF)

OptiPlex 960 Small Form Factor Chassis



The OptiPlex 960 SFF chassis has several features.

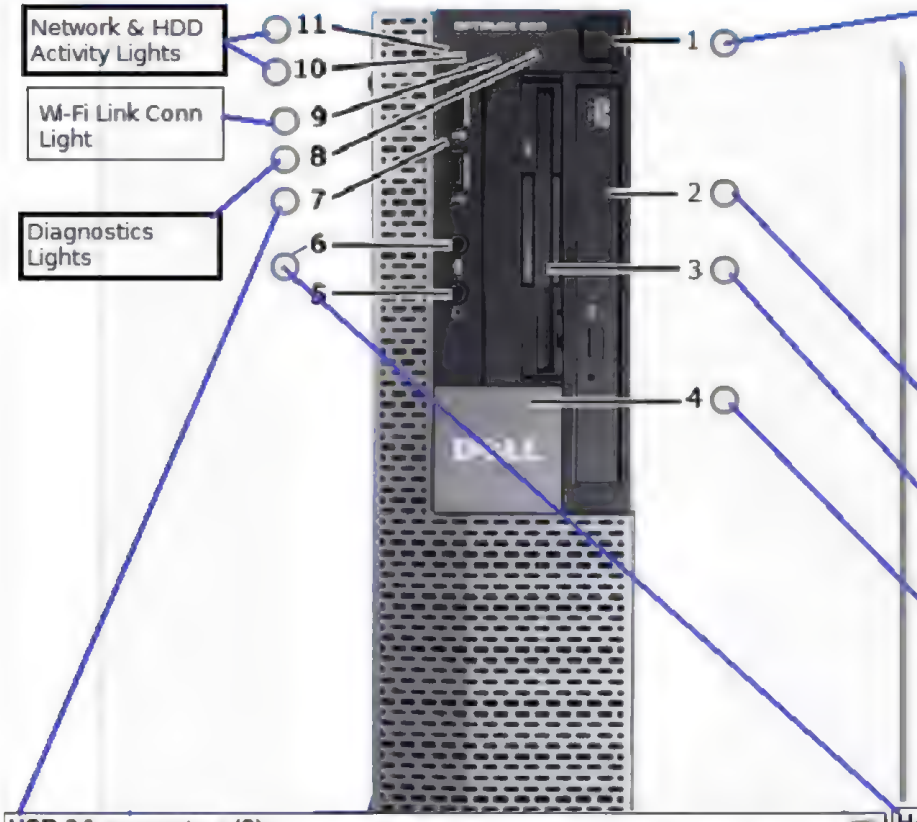
Click the ***Forward*** button to learn more about the front and back views of this chassis.

Front view:

1. Power button and power light
2. 5.25-inch drive bay
3. 3.5-inch drive bay
4. Dell badge
5. Headphone connector
6. Microphone connector
7. USB 2.0 connectors (2)
8. Diagnostic lights
9. Wi-Fi link connection light
10. Network link connection light
11. Hard drive activity light

Click each of the highlighted items to learn more.

OptiPlex 960 Small Form Factor Chassis



Power button and power light
Press to turn on the computer.

The power light illuminates and blinks or remains solid to indicate different operating states:

No light — The computer is turned off.

Steady blue — The computer is in a normal operating state.

Blinking blue — The computer is in a power-saving mode.

Blinking or solid amber — Possible no POST situation. Refer to the diagnostic lights.

To exit from a power-saving mode, press the power button or use the keyboard or the mouse if it is configured as a wake device in the Windows Device Manager.

5.25-inch drive bay
Can contain a slimline optical drive. Insert a CD or DVD (if supported) into this drive.

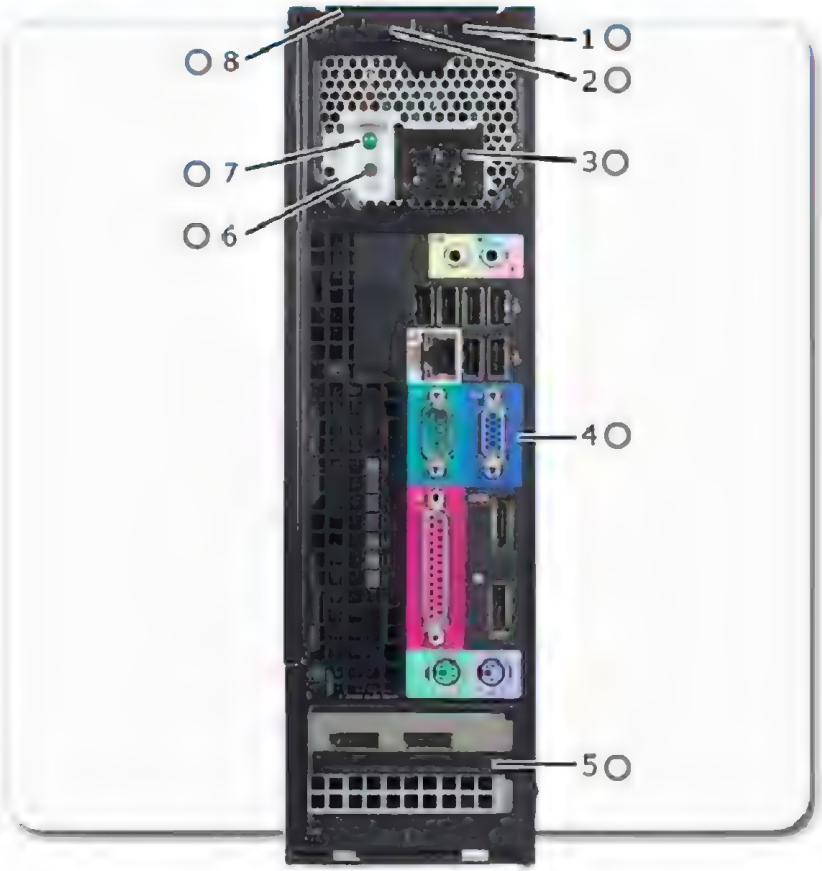
3.5-inch drive bay
Slimline Flex bay for optional floppy drive or optional media card reader.

Dell badge
This badge can be rotated to match the orientation of your computer. To rotate the badge, remove the top (side) cover and the front panel, press the blue button behind the badge to move it away from the front panel, and then rotate it. Replace the front panel and the top cover.

USB 2.0 connectors (2)
Use the front USB connectors for devices that you connect occasionally, such as joysticks or cameras, or for bootable USB devices. It is recommended that you use the back USB connectors for devices that typically remain connected, such as printers and keyboards.

Headphone and microphone connectors
Use the headphone connector to attach headphones and most kinds of speakers.

OptiPlex 960 Small Form Factor Chassis



The OptiPlex 960 SFF chassis has several features.

Click the ***Forward*** button to learn more about the front and back views of this chassis.

Back view:

1. Security cable slot
2. Padlock ring
3. Power connector
4. Back panel connectors
5. Expansion card slots
6. Power supply diagnostic button
7. Power supply status light
8. Cover release latch

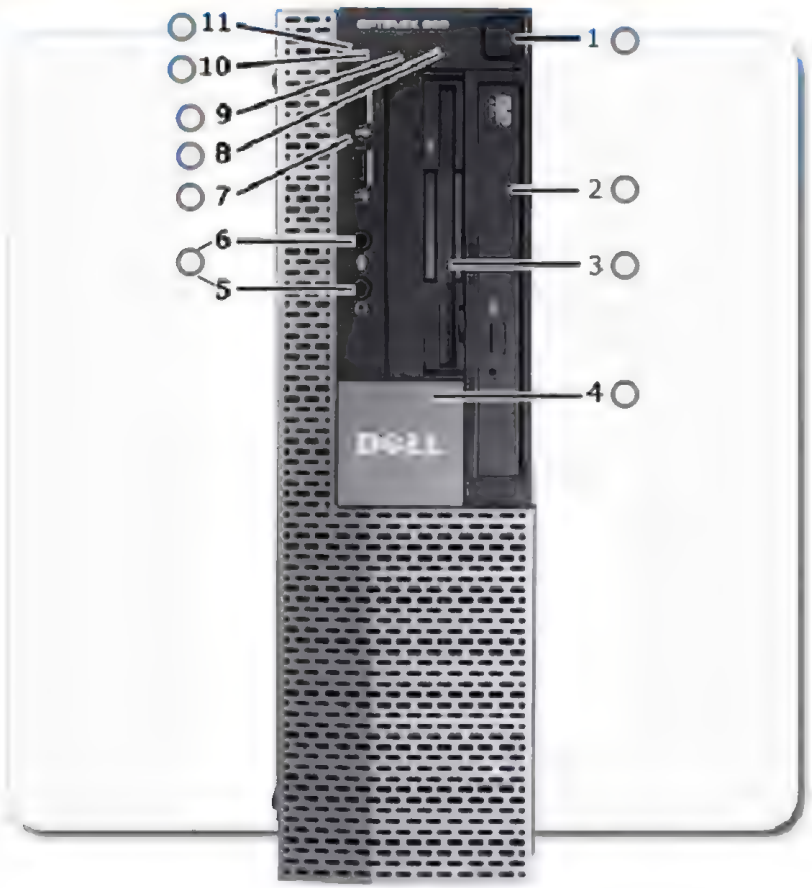
Click each of the highlighted items to learn more.

OptiPlex 960 Small Form Factor Chassis

The OptiPlex 960 SFF chassis has several features.

Click the ***Forward*** button to learn more about the front and back views of this chassis.

OptiPlex 960 Small Form Factor Chassis



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Front view:

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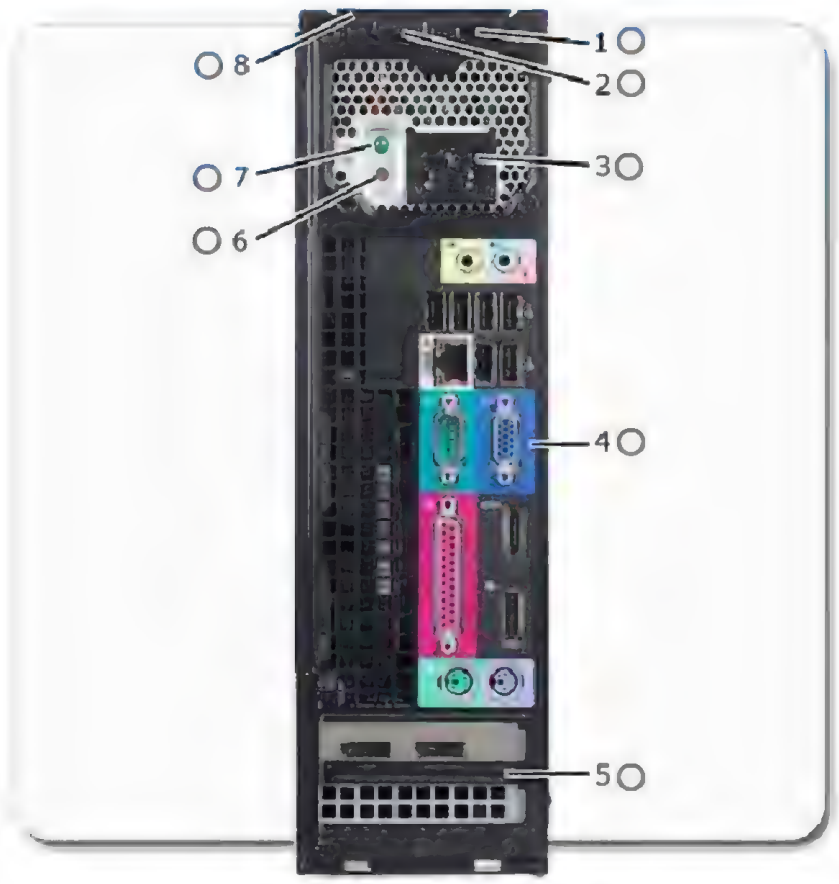
3. 3.5-inch drive bay
4. Dell badge
5. Headphone connector
6. Microphone connector
7. USB 2.0 connectors (2)
8. Diagnostic lights
9. Wi-Fi link connection light
10. Network link connection light
11. Hard drive activity light

Click each of the highlighted items to learn more.

OptiPlex 960 Small Form Factor Chassis



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3. Power connector
4. Back panel connectors
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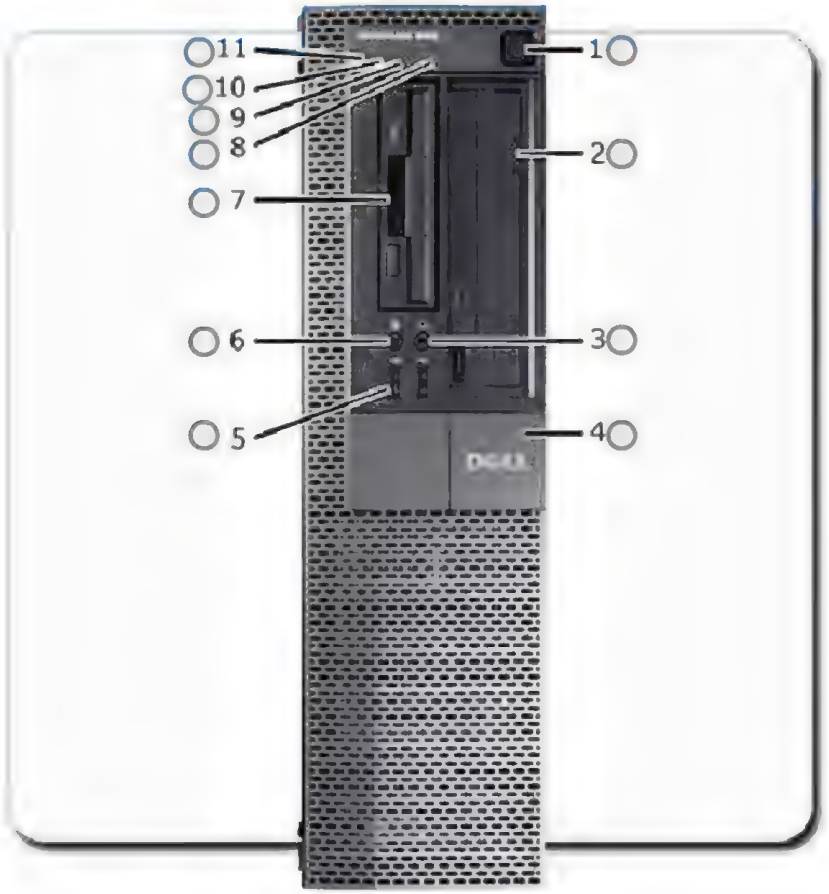
6. Power supply diagnostic button
7. Power supply status light
8. Cover release latch

Click each of the highlighted items to learn more.

OptiPlex 960 Desktop Chassis



The OptiPlex 960 Desktop chassis is the midsize chassis in this product family.

Click the ***Forward*** button to learn more about its features.

Front view:

1. Power button and power light
2. 5.25-inch drive bay
3. Headphone connector
4. Dell badge
5. USB 2.0 connectors (2)
6. Microphone connector
7. 3.5-inch drive bay
8. Diagnostic lights
9. Wi-Fi link connection light
10. Network link connection light
11. Hard drive activity light

Click each highlighted item to learn more.

OptiPlex 960 Desktop Chassis

The OptiPlex 960 Desktop chassis is the midsize chassis in this product family.

Click the ***Forward*** button to learn more about its features.

Front view:

1. Power button and power light
2. 5.25-inch drive bay
3. Headphone connector
4. Dell badge
5. USB 2.0 connectors (2)
6. Microphone connector
7. 3.5-inch drive bay
8. Diagnostic lights
9. Wi-Fi link connection light
10. Network link connection light
11. Hard drive activity light

Click each highlighted item to learn more.

Back view:

1. Security cable slot
2. Padlock ring
3. Power connector
4. Back panel connectors
5. Expansion card slots
6. Power supply status light
7. Power supply diagnostic button
8. Cover-release latch

Click each hightlighted area to learn more.

OptiPlex 960 Desktop Expansion Card Slots

The desktop chassis provides a variety of expansion card options. The riser enables customers to install full-height expansion cards whereas without the riser only low -profile cards fit into the chassis. Customers can choose from three different riser options on this system: one of two card options or a no-riser option. If the no-riser option is chosen, the customer's system has the standard back plate installed.

Riser with one PCI and one x16 Express slot

Riser with two PCI slots

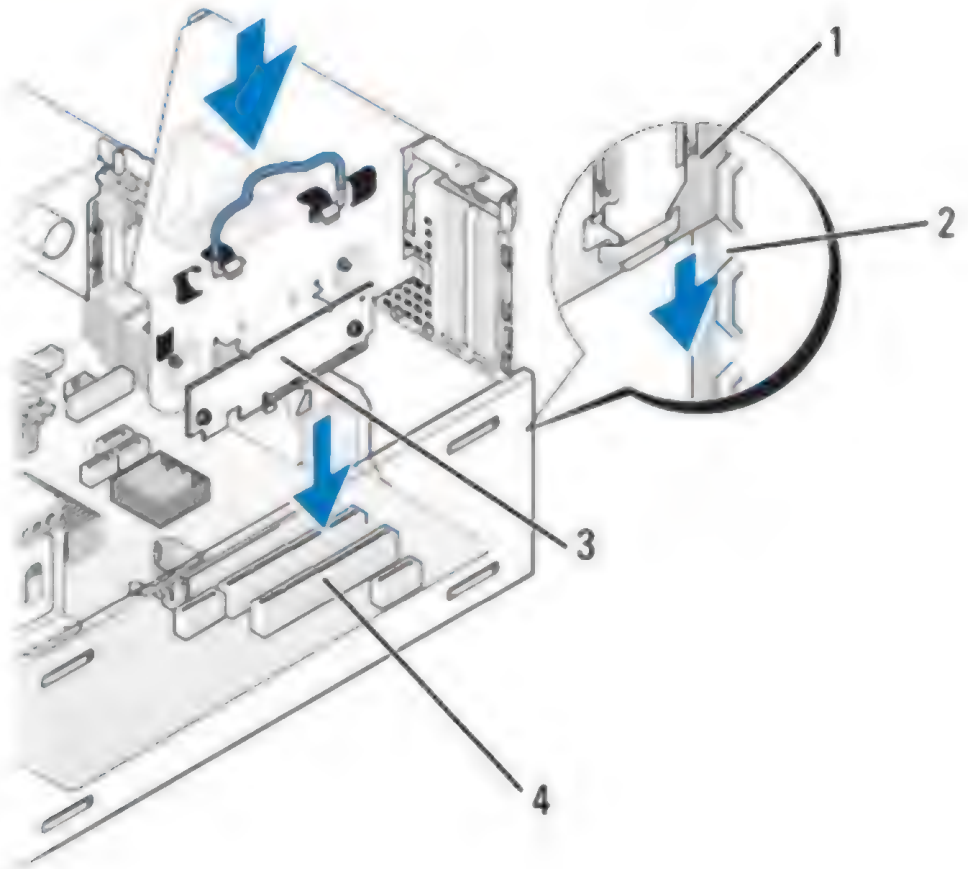
Standard back plate (no riser)

OptiPlex 960 Desktop Expansion Card Slots (continued)

When installed, the expansion-card cage (riser) connects to two of the system board connectors. The PCI-Express x16 slot and the adjacent PCI card slot on the system board are not available with the riser installed.

Note each of these pieces of the diagram:

1. Card cage
2. Slots
3. Riser boards (2)
4. System board connectors (2)

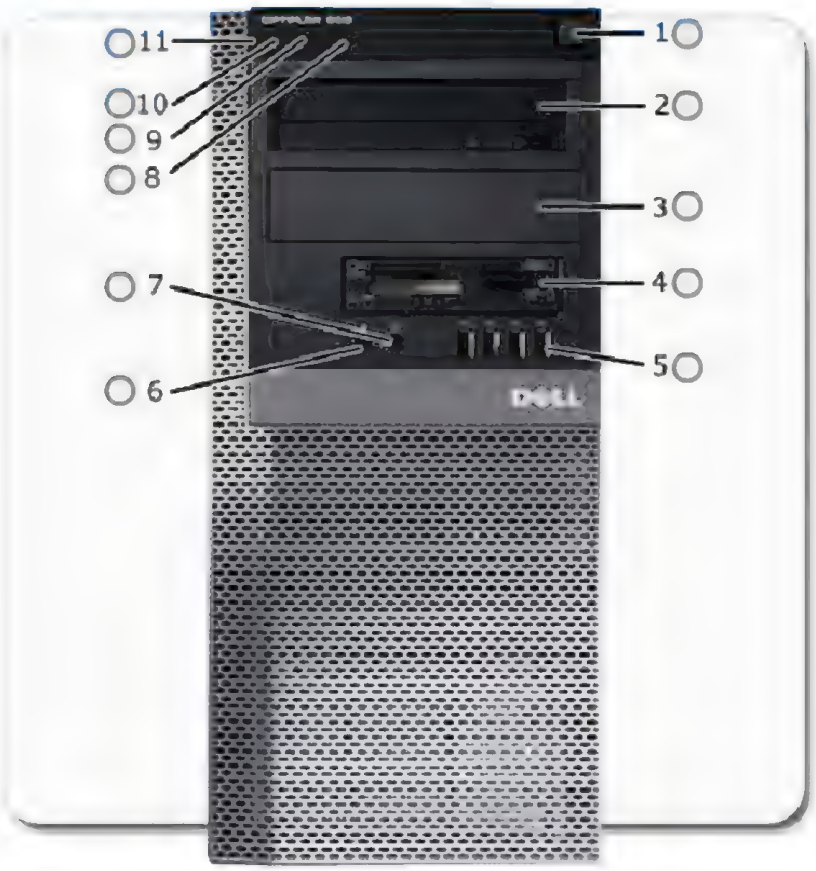


OptiPlex 960 Mini-Tower Chassis

The OptiPlex Mini-Tower chassis is the largest member of this product family.

Click ***Forward*** to investigate the different views of this chassis.

OptiPlex 960 Mini-Tower Chassis



The OptiPlex Mini-Tower chassis is the largest member of this product family.

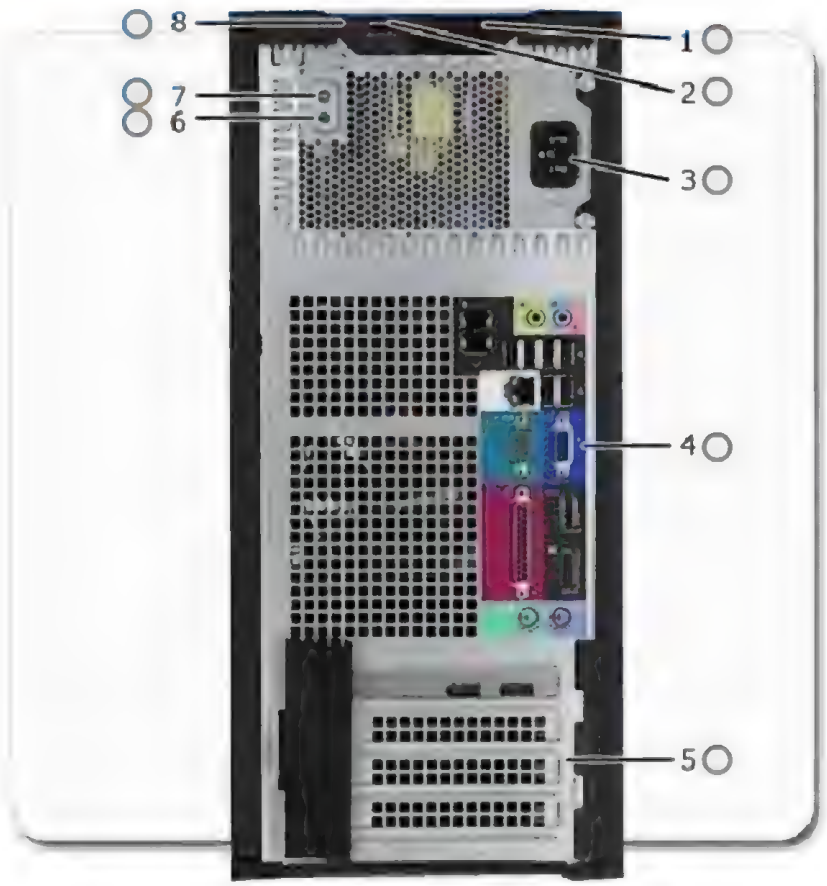
Click ***Forward*** to investigate the different views of this chassis.

Front view:

1. Power button and power light
2. 5.25-inch drive bay
3. 5.25-inch drive bay
4. 3.5-inch drive bay
5. USB 2.0 connectors (2)
6. Headphone connector
7. Microphone connector
8. Diagnostic lights
9. Wi-Fi link connection light
10. Network link connection light
11. Hard drive activity light

Click each highlighted item to learn more.

OptiPlex 960 Mini-Tower Chassis



The OptiPlex Mini-Tower chassis is the largest member of this product family.

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Front view:

1. Power button and power light
2. 5.25-inch drive bay
3. 5.25-inch drive bay
4. 3.5-inch drive bay
5. USB 2.0 connectors (2)
6. Headphone connector
7. Microphone connector
8. Diagnostic lights
9. Wi-Fi link connection light
10. Network link connection light
11. Hard drive activity light

Click each highlighted item to learn more.

Back view:

1. Security cable slot
2. Padlock ring
3. Power connector
4. Back panel connectors
5. Expansion card slots
6. Power supply diagnostic button
7. Power supply status light
8. Cover-release latch

Click each highlighted item to learn more.

Knowledge Check

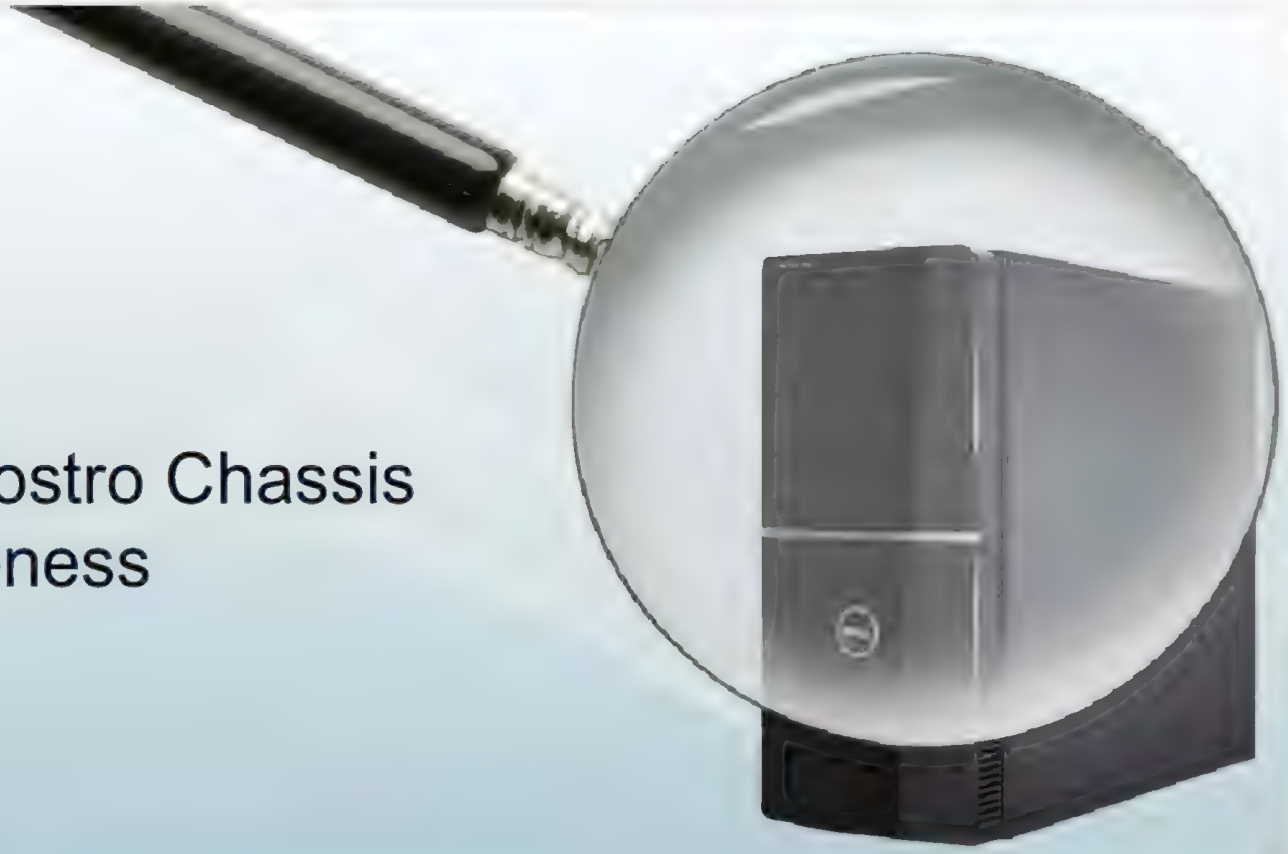
What form factors is the OptiPlex 960 available in? (Select all that apply.)

Make your selection, and click **DONE** when you are finished.

- A Mini-tower (MT)
- B Desktop (DT)
- C Small Form Factor (SFF)
- D Ultra-small Form Factor (USFF)

Correct!

Dell Vostro Chassis Awareness



Objectives

The Dell Vostro family of products is targeted to small business customers, with emphasis on simplifying their purchasing process.

After completing this topic, you should be able to differentiate between the Vostro desktop models, identify chassis features for all Vostro desktop models, and list form factors for the Vostro desktop family.

Vostro 430 Chassis

The Vostro 430 is a large-format tower chassis for maximum expansion, performance, and system capability.

Click ***Forward*** to learn more about the different views of the Vostro 430 chassis.

Vostro 430 Chassis

The Vostro 430 is a large-format tower chassis for maximum expansion, performance, and system capability.

Click ***Forward*** to learn more about the different views of the Vostro 430 chassis.

Front view:

1. Drive bay front panel (open)
2. Optical drive eject buttons (2)
3. USB connectors (4)
4. Front panel door (open)
5. Power button
6. Headphone connector
7. Microphone connector
8. Media card reader - optional
9. Drive-activity light
10. Secondary Optical drive (optional)
11. Optical drive

Vostro 430 Chassis

The Vostro 430 is a large-format tower chassis for maximum expansion, performance, and system capability.

Click ***Forward*** to learn more about the different views of the Vostro 430 chassis.

Back view:

1. Padlock rings
2. Security cable slot
3. Expansion card slots (4)
4. Back panel connectors
5. Voltage selector switch
6. Power connector
7. Power Supply Diagnostic LED

Vostro 230 Chassis

The 230 has a medium-size chassis.

Click ***Forward*** to learn more about the different views of the Vostro 230 chassis.

Vostro 230 Chassis

The 230 has a medium-size chassis.

Click ***Forward*** to learn more about the different views of the Vostro 230 chassis.

Front view:

1. Optical drive
2. Optical drive eject button
3. Optional optical-drive bay
4. USB 2.0 connectors (2)
5. Power button
6. Microphone connector
7. Headphone connector
8. 19 in 1 media card reader (optional)

Vostro 230 Chassis

The 230 has a medium-size chassis.

Click *Forward* to learn more about the different views of the Vostro 230 chassis.

Front view:

1. Optical drive
2. Optical drive eject button
3. Optional optical-drive bay
4. USB 2.0 connectors (2)
5. Power button
6. Microphone connector
7. Headphone connector
8. 19 in 1 media card reader (optional)

Back view:

1. Power cable connector
2. Voltage selector switch
3. Back panel connector
4. Expansion card slots (4)

Vostro 230s Chassis

The 230s has a smaller, slim chassis that is simple, functional, and less obtrusive. This system is fully capable and can be used as a desktop placed on top of the desk, or slim tower hidden under a desk.

Click ***Forward*** to learn more about the different views of the Vostro 230s chassis.

Vostro 230s Chassis

The 230s has a smaller, slim chassis that is simple, functional, and less obtrusive. This system is fully capable and can be used as a desktop placed on top of the desk, or slim tower hidden under a desk.

Click ***Forward*** to learn more about the different views of the Vostro 230s chassis.

Front view:

1. Optical drive
2. Power button
3. Optical drive eject button
4. Drive activity light
5. 8-in-1 medica card reader (optional)
6. Headphone connector
7. Microphone connector
8. Drive-activity light
9. USB 2.0 connectors (2)

Vostro 230s Chassis

The 230s has a smaller, slim chassis that is simple, functional, and less obtrusive. This system is fully capable and can be used as a desktop placed on top of the desk, or slim tower hidden under a desk.

Click ***Forward*** to learn more about the different views of the Vostro 230s chassis.

Back view:

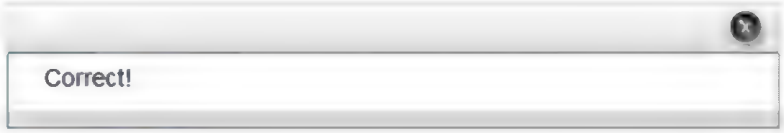
1. Back-panel connectors
2. Expansion card slots (4)
3. Power cable connector
4. Power supply light

Knowledge Check

What form factors are Vostro desktops available in? (Select all that apply.)

Make your selection, and click **DONE** when you are finished.

- (A) Mini-Tower
- (B) Desktop
- (C) Tower
- (D) Small-Form Factor
- (E) Slim Tower



Dell Precision Workstation Chassis Awareness

Objectives

The Precision Workstation family is for customers who require a workstation-class CPU.

After completing this topic, you should be able to differentiate between the Precision Workstation models, and idenfity features for the Precision Workstation desktop models.

Precision T7500

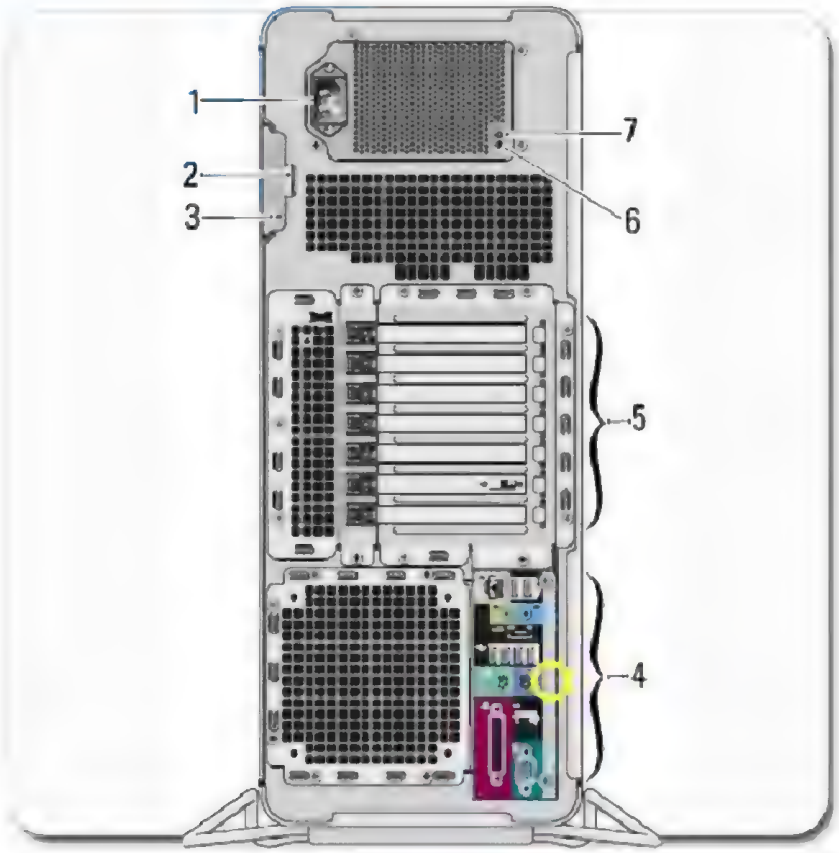
The T7500 workstation supports two CPU socket configurations.

Click ***Forward*** to learn more about the different views of the Precision T7500 chassis.

Front view:

1. Optical drive
2. Optical drive filler panels
3. FlexBay (optional floppy drive)
4. Network link light
5. Headphone connector
6. Microphone connector
7. Power button, power light
8. Diagnostic lights (4)
9. USB 2.0 connectors (2)
10. IEEE 1394 connector
11. Drive activity light
12. Optical drive eject button

Precision T7500



The T7500 workstation supports two CPU socket configurations.

Click ***Forward*** to learn more about the different views of the Precision T7500 chassis.

Front view:

1. Optical drive
2. Optical drive filler panels
3. FlexBay (optional floppy drive)
4. Network link light
5. Headphone connector
6. Microphone connector
7. Power button, power light
8. Diagnostic lights (4)
9. USB 2.0 connectors (2)
10. IEEE 1394 connector
11. Drive activity light
12. Optical drive eject button

Back view:

1. Power connector
2. Cover release latch and padlock ring
3. Security cable slot
4. Back panel connectors
5. Expansion card slots (6)
6. Power supply diagnostic button
7. Power supply diagnostic light

Click the highlighted back connector panel to learn more about its connectors.

Precision R5400

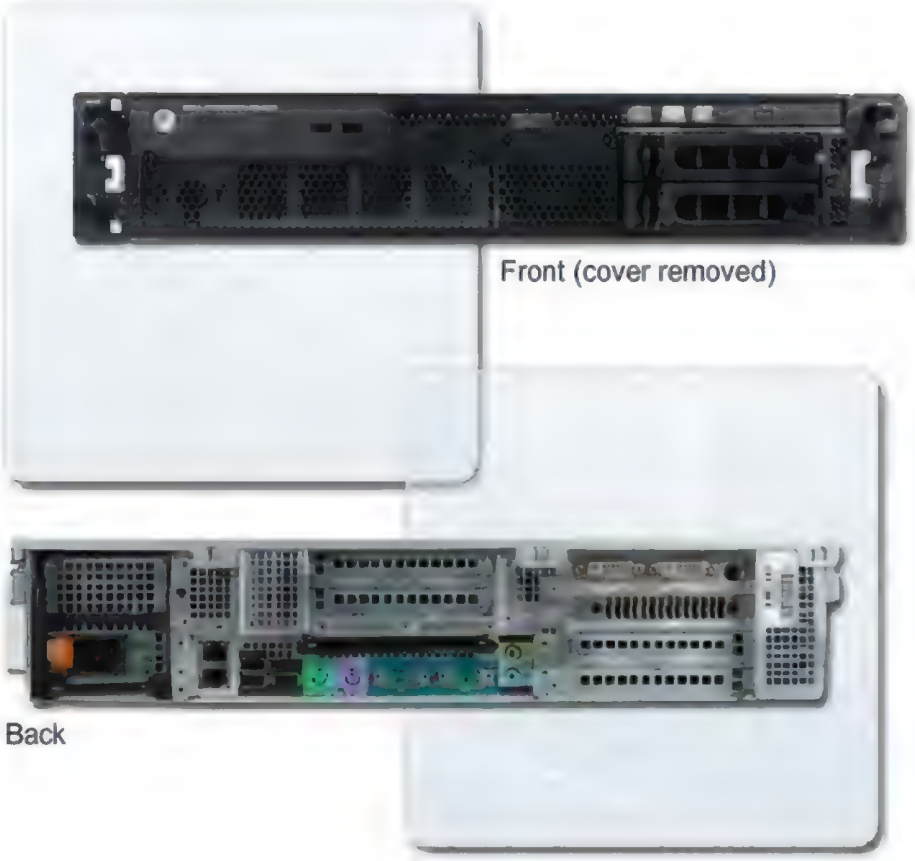
This platform utilizes a 2U (2 unit) height chassis with a maximum length of 27". It features dual-socket CPUs, dual PCI-E x16 slots for graphics, and two additional legacy slots.

The T5400 has these physical attributes:

- Height: 8.656 cm (3.40 inches)
- Width: 42.62 cm (16.78 inches)
- Depth (with front bezel): 68.45 cm (26.95 inches)
- Weight (with front bezel): 20.85 kg (45.97 lb)

Note: The majority of customers are expected to deploy systems locally and will not require remote graphics capability. For those customers who require remote graphics capability, a solution has been developed for this, branded the FX100. The system's technology is very similar to the Dell Precision T5400.

Precision R5400 Chassis



Front (cover removed)

Back

Knowledge Check

True or false: Dual socket CPUs and Dual PCI-E x16 slots for graphics are part of the Precision R5400.

Make your selection, and click **DONE** when you are finished.

- (A) True
- (B) False

Correct!

Review

Dekstop and Workstation chassis come in a variety of form factors. All Dell Desktop chassis have these **key features**:

- Safe, intuitive hardware access
- Maintainability and serviceability
- Color-coding of components for easy identification

How to open a Dell chassis depends upon the Desktop model.

- Press the buttons on either side of the chassis simultaneously
- Release the door latch
- Put the chassis down on its side and open it using the sliding button
- Remove screws that secure the cover

The **R5400** is the first Precision workstation with a rack mountable design.

A **riser** allows installation of full-height expansion cards.

Dell Desktop chassis may include these **standard diagnostic indicators**:

- Wi-Fi connection light
- Network link connection light
- Hard drive activity light
- Power supply diagnostic button
- Power supply status light

BIOS Overview

Objectives

This topic reviews BIOS basics–what the BIOS is, how to access its settings, and basic security concepts.

After completing this topic, you will be able to identify the features of the BIOS.

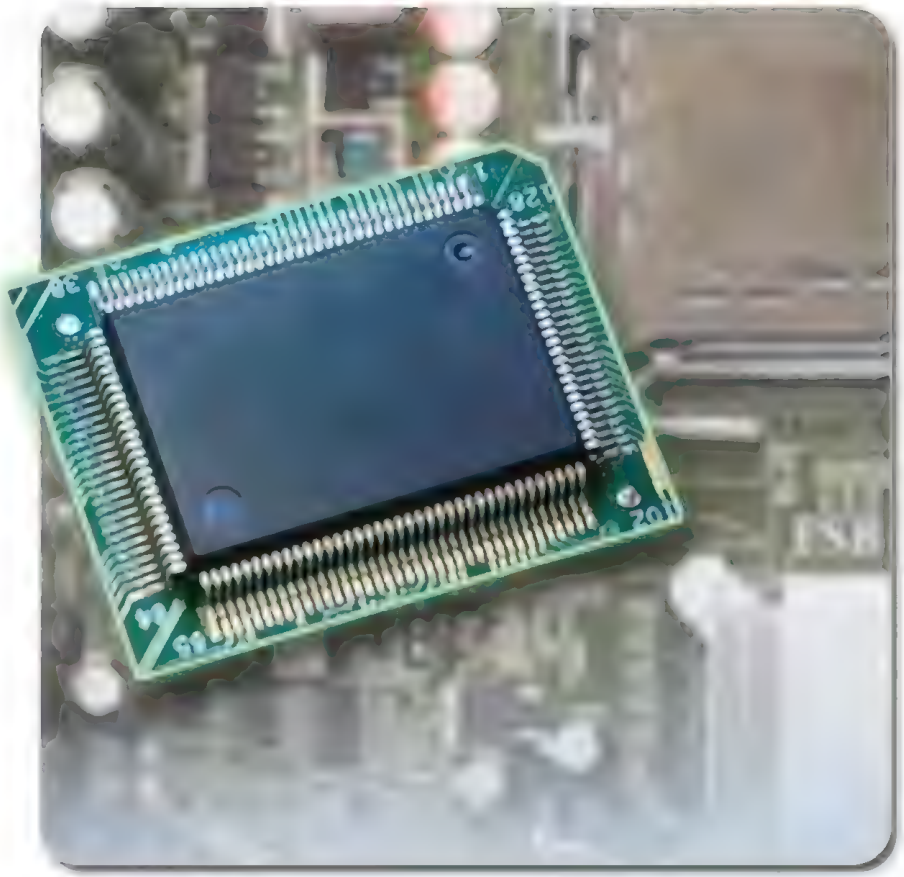
BIOS Introduction

BIOS stands for Basic Input Output System and is essentially a low-level software program. It gets the systems from <off> mode to the <operating system loading> mode. The BIOS resides in an onboard complementary oxide semiconductor (CMOS) chip.

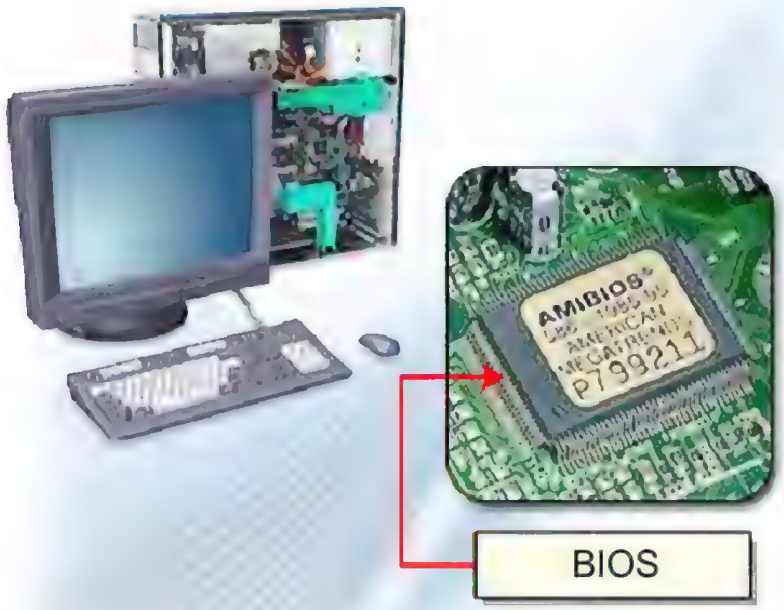
The system BIOS has three key functions:

- Enables the system to run when you turn on the system.
- Attempts to boot to the operating system.
- Ensures all chips, hard drives, ports, and processors function together.

The **System Setup Utility** provides a user interface in the BIOS setup program that is particularly useful for troubleshooting. For example, you can enter the system setup to check whether devices are enabled or disabled and whether drives are detected, and to tweak settings to enhance or tailor the system's power management, processor, or video performance. Note that the user interface for the BIOS is specific to the system type and BIOS for the machine.



BIOS Location



The BIOS is typically stored in EEPROM. PROM is embedded into a CMOS chip in the system and is often called PROM BIOS. EEPROM BIOS contains the code that allows a system to boot.

The CMOS contains a section of memory that is volatile and requires a power source at all times. A small battery supplies continuous power to the CMOS chip, ensuring that the real-time clock and user settings are always available and cannot be reset by power failures. When the battery is nearing the end of its life, you may notice that the BIOS settings revert to the Dell defaults when the system is turned off. Date and time reversions are usually most evident.

Note: Many computer manufacturers design systems so that the BIOS is copied from ROM to RAM each time the system is booted, which allows the system to access that information quickly. This is known as *Shadow BIOS ROM*, *Shadow Memory*, and *Shadow RAM*.

Types of BIOS

Most modern PCs have a **flash** BIOS. A flash BIOS is a BIOS that can be erased and rewritten, typically through the combination of an electrical process and a program. A flash BIOS that can handle Plug and Play (PnP) devices is also known as a PnP BIOS.

If an update is required, the BIOS can be erased and rewritten using an electrical process. Hence, the technology is called Electrically Erasable Programmable Read-Only Memory (EEPROM). The procedure involved is called "flashing the BIOS."

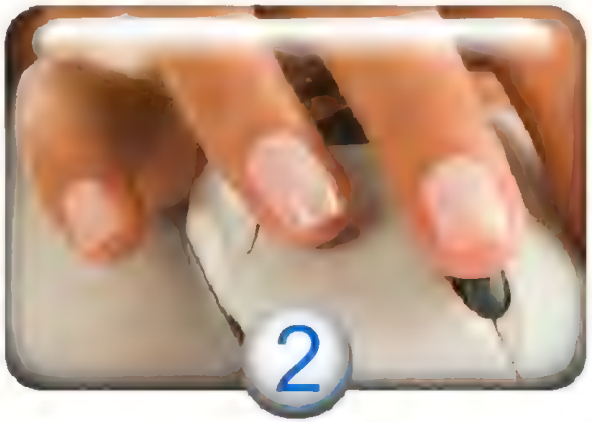
Updating, or Flashing, the BIOS

In general, most PCs have fairly standardized BIOS versions, although the methods used to flash them are specific to the computer vendors.

Note: You should maintain an updated BIOS, the latest version of which can be found on the online support site. Be aware that flashing a BIOS on a portable system will require that the AC adapter be plugged in and that there is a working battery installed. For system stability purposes, the flash will not initiate without both present.

Typically, the updating process involves the following steps. *Click each step to learn more.*

1. Download the file to your chosen location.



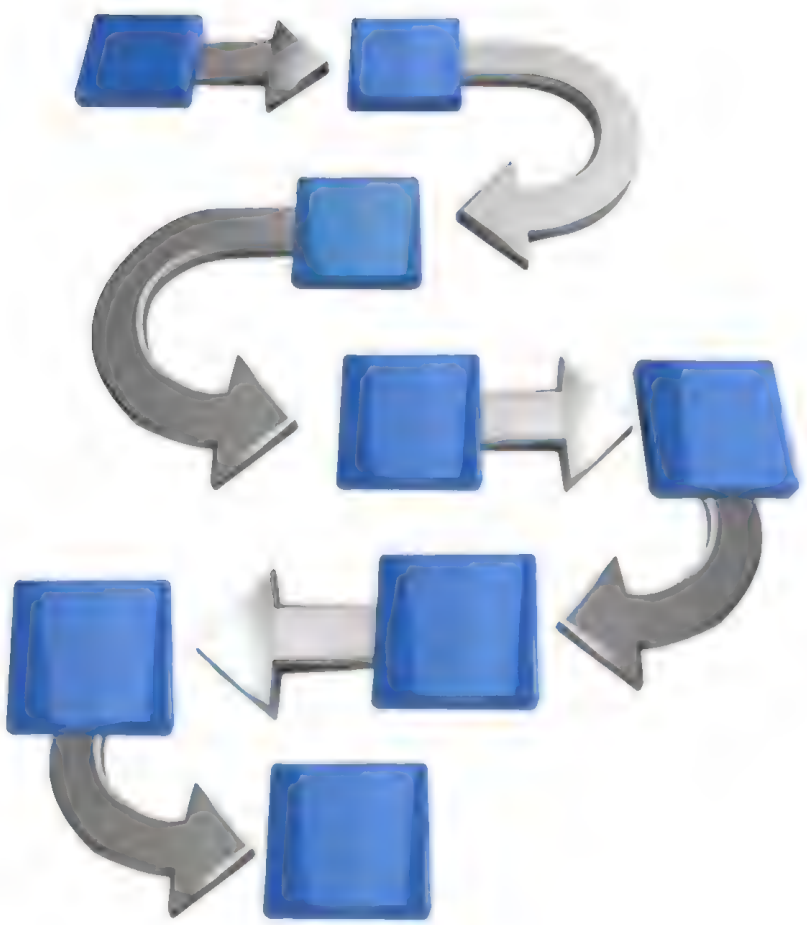
2. Double-click the file to execute it. This will often prompt the flash directly from within Windows and ask you to restart. If this method is not supported, you will be asked to supply a floppy disk to create a boot disk.

3. If a boot disk is required, boot to the disk by altering the boot sequence (if needed) through the one-time boot menu and then completing the intuitive process.

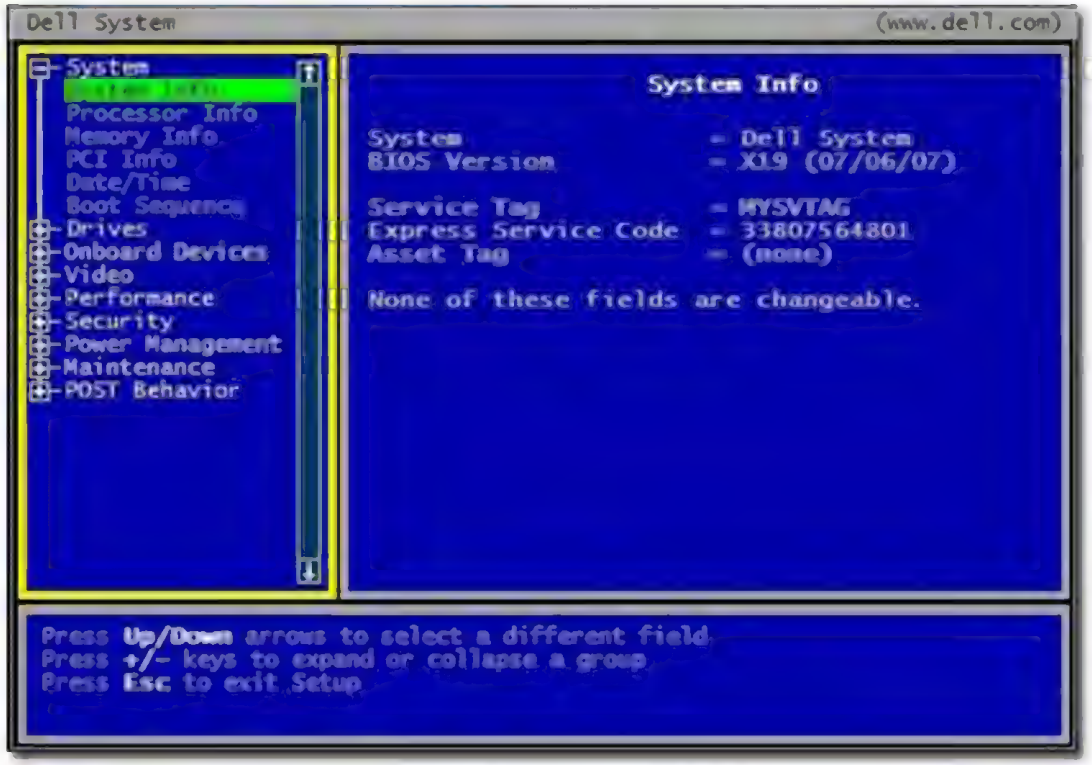
BIOS Sequence

The following are the steps that a typical boot sequence involves:

1. The internal power supply board turns on and initializes. The chipset receives the signal from the power supply board and passes it along to the processors.
2. The BIOS performs the Power-On Self Test (POST).
3. The BIOS looks for the video chip and the video's built-in BIOS program and runs it.
4. The BIOS does more tests on the system, including the memory count-up test that you sometimes see on the screen.
5. The BIOS performs a **system inventory** to determine what sort of hardware is in the system.
6. Some versions of the BIOS will now display a summary screen about your system's configuration.
7. The BIOS begins the search for a boot drive.
8. If it finds what it is looking for, the BIOS starts the process of booting the operating system, using the information in the boot sequence.



System Setup Utility



The System Setup is a utility provided by the BIOS; during POST it is accessed via a keystroke. This utility enables users to change parameters that affect the BIOS and system configuration.

You can use System Setup to:

- Change the system configuration information after you add, change, or remove any hardware in your computer.
- Set or change a user-selectable option such as the user password.
- Read the current amount of memory or view the type of hard drive installed.

Here you can see the Dell multipage BIOS, which is featured on the OptiPlex 330 system. The System Setup lists all the possible fields and options within System Setup for this platform.

Warning: Changing advanced parameters can lead to system instability and data loss. It is highly recommended that you back up your hard drive contents before making any changes and that you proceed with caution. You should make an effort to fully understand the implications of the settings you might be changing. Full details can be found in the online and system-specific manuals.

Entering the BIOS

To enter the BIOS setup, you can perform either of the following steps. *Click each to learn more.*

Note: Navigation and features accessible through the **System Setup Utility** (SSU) vary by system. Refer to the *User's Guide* or *Service Manual* for your system for specific information.

Press the **<F2>** key when prompted at start-up.

Press the **<F12>** key at start-up to access the one-time boot menu and select **System Setup** from the options provided.

BIOS-Level Security for Desktops

A user can set two types of master passwords in the BIOS of a Dell desktop:

Prevents a user from booting to any media. A password prompt appears as soon as the system is switched on.

Enables the user to boot to the operating system and use the machine, but prevents the user from making any changes in the BIOS.

Warning: If you leave your system running and unattended without having a system password assigned, or if you leave your system unlocked so that someone can disable the password by changing a jumper setting, anyone can access the data stored on your hard drive.

Enabling BIOS Security

BIOS passwords on desktop systems can be enabled or disabled with a jumper on the system board.

Note: A support request to override the BIOS password cannot be made through the online logging tool. You are advised to call your technical support representative with the relevant proof -of-ownership information.

Refer to your system's *User's Guide* or *Service Manual* for the specific procedure for clearing passwords. A typical procedure is to:

Click the ***Forward*** button to learn more.

Enabling BIOS Security

BIOS passwords on desktop systems can be enabled or disabled with a jumper on the system board.

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Refer to your system's *User's Guide* or *Service Manual* for the specific procedure for clearing passwords. A typical procedure is to:

Click the ***Forward*** button to learn more.

- Turn off the system and disconnect the power cable from the electrical outlet.
- Remove the system cover.

Enabling BIOS Security

BIOS passwords on desktop systems can be enabled or disabled with a jumper on the system board.

Note: A support request to override the BIOS password cannot be made through the online logging tool. You are advised to call your technical support representative with the relevant proof -of-ownership information.

Refer to your system's *User's Guide* or *Service Manual* for the specific procedure for clearing passwords. A typical procedure is to:

Click the ***Forward*** button to learn more.

- Locate the 2-pin password jumper (PSWD) on the system board and remove it to clear the password.
- Close the cover.

Enabling BIOS Security

BIOS passwords on desktop systems can be enabled or disabled with a jumper on the system board.

Note: A support request to override the BIOS password cannot be made through the online logging tool. You are advised to call your technical support representative with the relevant proof -of-ownership information.

Refer to your system's *User's Guide* or *Service Manual* for the specific procedure for clearing passwords. A typical procedure is to:

Click the ***Forward*** button to learn more.

- Connect the system and monitor to electrical outlets and turn them on.
- Boot the BIOS by pressing F2 after the power is turned on, and then shut down.
- Turn off the monitor and disconnect it from the electrical outlet.
- Disconnect the power cable from the electrical outlet, and then press the power button to ground the system board.

Enabling BIOS Security

BIOS passwords on desktop systems can be enabled or disabled with a jumper on the system board.

Note: A support request to override the BIOS password cannot be made through the online logging tool. You are advised to call your technical support representative with the relevant proof -of-ownership information.

Refer to your system's *User's Guide* or *Service Manual* for the specific procedure for clearing passwords. A typical procedure is to:

Click the ***Forward*** button to learn more.

- Open the cover.
- Locate the 2-pin password jumper on the system board and attach it to re-enable the password feature.

Enabling BIOS Security

BIOS passwords on desktop systems can be enabled or disabled with a jumper on the system board.

Note: A support request to override the BIOS password cannot be made through the online logging tool. You are advised to call your technical support representative with the relevant proof -of-ownership information.

Refer to your system's *User's Guide* or *Service Manual* for the specific procedure for clearing passwords. A typical procedure is to:

Click the ***Forward*** button to learn more.

- Close the cover.
- Connect the system and devices to electrical outlets and turn them on.
- Assign a new system and/or Administrator password.

Advanced Configuration and Power Interface

Advanced Configuration and Power Interface (ACPI) is an industry standard for recognizing hardware, configuring devices, and managing power.

Power management is the most visible aspect of ACPI. ACPI moves control of power management from the BIOS to the operating system. This ability can be enabled or disabled in the System Setup Utility.

ACPI enables the operating system to suspend operation and enter standby or hibernation. For more information about these states, see *Sleep States*.

For the operating system to control power management, the following components must all be ACPI-capable:

- Operating system
- Power supply
- Processor

Global and Sleep States

In sleep or standby state, the system turns off the internal components to reduce power consumption. There are five sleep state indicators and three global states. *Click each to learn more.*

G1	*Sleeping:* This state subdivides into the four states S1 through S4: • **S1**: All processor caches are flushed, and the CPU(s) stop executing instructions. Power to the CPU(s) and RAM is maintained; devices that do not indicate they must remain on may be powered down. • **S2**: The CPU is powered off. • **S3**: Commonly referred to as Standby or Sleep. RAM is still powered. • **S4**: Hibernation. All content of main memory is saved to non-volatile memory such as a hard drive, and is powered down.
G2	
G3	

Global and Sleep States

In sleep or standby state, the system turns off the internal components to reduce power consumption. There are five sleep state indicators and three global states. *Click each to learn more.*

G1	
G2	
G3	

*Soft Off (*S5):
G2, *S5*, and *Soft Off* are synonyms. G2 is almost the same as *G3 Mechanical Off*, but some components remain powered so the computer can "wake" from input from the keyboard, clock, modem, LAN, or USB device.

Global and Sleep States

In sleep or standby state, the system turns off the internal components to reduce power consumption. There are five sleep state indicators and three global states. *Click each to learn more.*

G1

G2

G3

Mechanical Off:
The computer's power consumption approaches zero, to the point that the power cord can be removed and the system is safe for disassembly (typically, only the real-time clock is running off its own small battery).

Note There is another assumed sleep state: G0 (sometimes referred to as S0). This is the *Working* state.

Knowledge Check

Which of the following keys is used during start-up to access the one-time boot menu of a Dell computer?

Make your selection, and click **DONE** when you are finished.

A) F2

B) F...

C) F8

D) F12

Correct!

The Boot Process Explained

Objectives

This topic reviews the boot process and the BIOS's role in it. You will learn about some of the system indicators that you can use to troubleshoot problems during the boot process.

After completing this topic, you will be able to list the stages of the boot process and identify the significance of system indicators during the boot process.

Stages of the Boot Process

Every time your system boots, it passes through five distinct boot stages The sequence of these stages is

1

Off	**Off** In this stage, there is no power supply to the system.
Power	
Pre-POST (Power On Self-Test)	
POST	
Boot	

Stages of the Boot Process

Every time your system boots, it passes through five distinct boot stages The sequence of these stages is:

2

Off	**Power** In this stage, the system receives power from a power source and distributes the power to the internal components.
Power	
Pre-POST (Power On Self-Test)	
POST	
Boot	

3

Stages of the Boot Process

Every time your system boots, it passes through five distinct boot stages. The sequence of these stages is:

Off
Power
[illegible]
POST
Boot

Pre-POST
In this stage, the system can receive power and distribute this power to its internal components but cannot process data.

4

Stages of the Boot Process

Every time your system boots, it passes through five distinct boot stages. The sequence of these stages is:

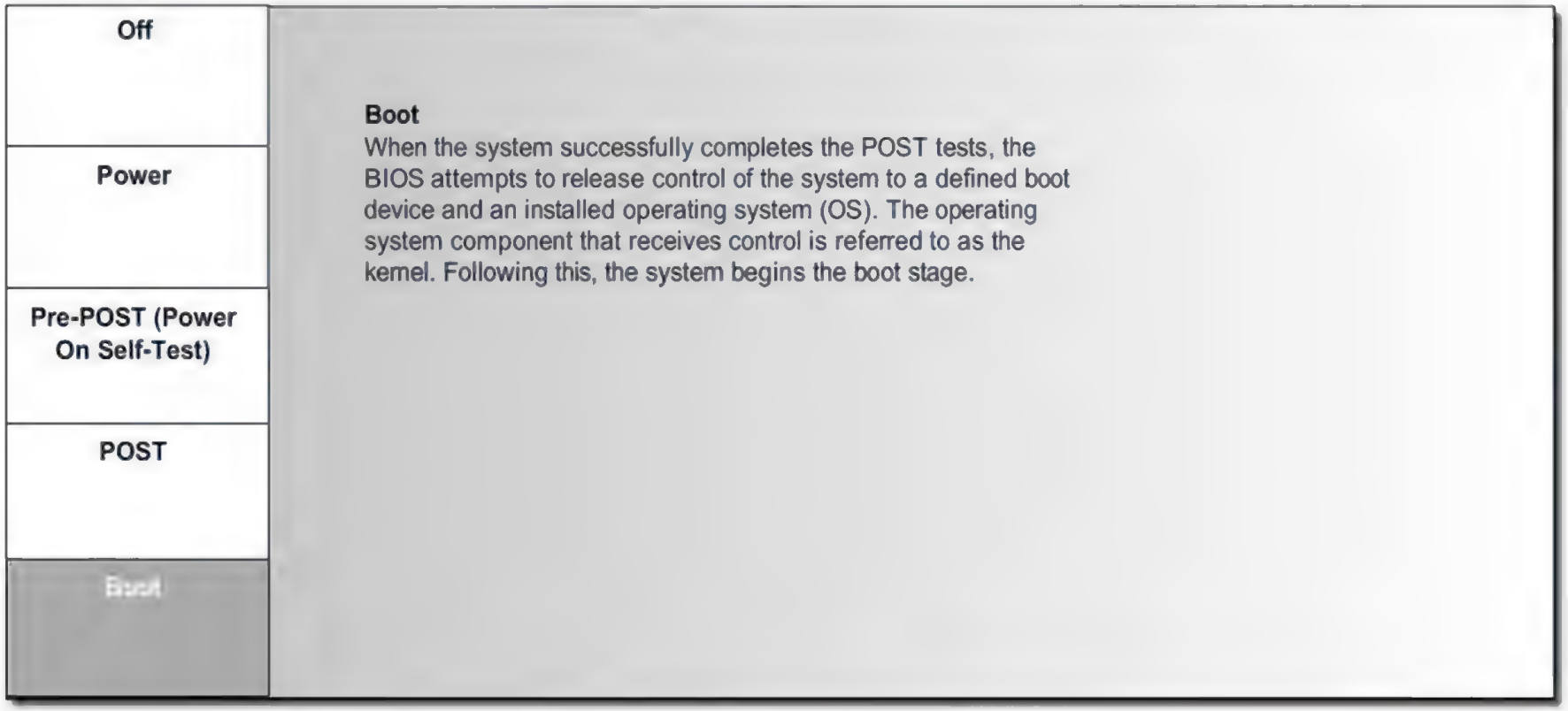
Off
Power
Pre-POST (Power On Self-Test)
[illegible]
Boot

POST
In this stage, the system processes a series of instructions that check, test, and initiate system components. These tests are commonly known as POST tests. The executed code that provides for the instruction set is stored in the BIOS.

Stages of the Boot Process

5

Every time your system boots, it passes through five distinct boot stages. The sequence of these stages is:



Power Button LED States

	Power	Pre-POST	POST	BOOT	
Required Components	Power Source Power Supply System Board	Power Up Components Chipset Processor	Memory Video Etc.	**Detection:** System Setup Cable Jumper Drive	**Boot:** Active Partition Boot Files Boot Server CD ROM
Power Button LEDs	Off (Blank) Blinking Amber	Solid Amber	Solid Green	Solid Green	
Quad-Pack LEDs	Off (Blank)	Off (Blank)	Various	Off/GGGG	

The power LED changes its state to reflect the system transition through the associated POST routines. It indicates the stage at which the process failed during POST, but it does not identify the component responsible for the failure.

When the system completes POST normally, the change in LED code for each phase of the process occurs fairly quickly, making it difficult to distinguish between the stages. When the system fails to complete POST, the power LED remains in the last successful state.

No unique LED code indicates the Boot state. Once the power button LED changes from solid amber to solid green, it does not change until the system either enters a sleep state or is turned off. The distinction between the POST and Boot states is shown on the LED Quad-Pack instead.

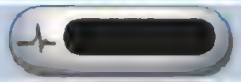
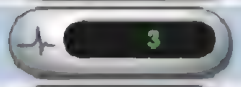
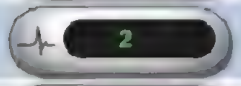
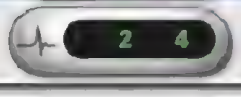
Note: OptiPlex and Precision desktops include a variable state power button LED. The occurrence of distinct events triggers a change in the state of the LED. The variable state power button LED displays five different visual codes or states, and provides you with information about the state of the system, or the stage wherein a failure occurred.

The Diagnostic Quad-Pack

The diagnostic or LED Quad-Pack provides information about the current stage or set of POST tests that the system is cycling through. If the system fails on a particular check or test, the Quad-Pack will highlight the stage at which the system halted via an LED code. That information gives you a good starting point for troubleshooting.

On some systems, the LED Quad-Pack remains lit after the operating system loads. On other systems, the LED Quad-Pack turns off when the BIOS passes control to the operating system.

Note: Always check your system's *User's Guide* or *Service Manual* to determine the exact meaning of the LED Quad-Pack code.

LED Pattern 1 2 3 4	LED Pattern	State Name	State Description
	Off	Off	System POST complete – LED time-out has occurred
	4	RCM	BIOS checksum failure – Recovery mode
	3	CPU	CPU configuration activity or failure–CPU Cache failure
	3 4	MEM	Memory subsystem configuration activity or failure
	2	PCI	PCI device configuration or failure
	2 4	VID	Video subsystem configuration or failure

Sleep States and the Boot Process

The sleep states most relevant to the boot process are:

Click each sleep state to learn more.

Standby is also called **suspend to RAM**. Windows Vista refers to S3 as **sleep.**

- You can tell that the system is in standby by the blinking power LED.
- Older systems are more likely to support S1, which leaves the processor and many peripherals fully powered, than S3.
- More recent systems may not support S1.
- Even if the processor may be completely off, RAM is powered.
- Loss of power results in a loss of all unsaved data.

Resuming from standby involves restoring power to the processor and peripherals. Because the operating system is still in RAM, the system does not POST, and the operating system does not load again.

Sleep States and the Boot Process

The sleep states most relevant to the boot process are:

Click each sleep state to learn more.

- The Power LED is off.
- Everything in RAM is stored in a file on the hard drive.
- The system is completely without power, except for flea power.

Resuming from hibernation requires a normal power-on and POST. When the BIOS hands over control to the operating system, it restores the contents of **hibersys.dat** to RAM.

Note that hibernation will not take precedence over the boot order. Leaving bootable media in the system may result in failure of hibernation to resume.

Sleep States and the Boot Process

The sleep states most relevant to the boot process are:

Click each sleep state to learn more.

The power LED is off, but flea power is still being supplied to the system board. This enables peripherals, such as certain NICs or modems, to turn on the system.

The standard boot process described in this module describes booting from an S5 state.

Beep Codes and Error Messages

You can also receive indications about the boot process through:

- **Text error messages**: The error messages provide information about a current or previous boot failure.
- **Beep codes**: A beep code consists of three or four groups of beeps separated by pauses. Beep codes relay the offending checkpoint in a situation when a previous boot failed before video was initialized. To interpret a beep code, count the short beeps between each pause (denoted by a dash) to get the full error code.

The error code information provided by error messages and/or beep codes can be looked up online, under the appropriate system's user manual.

Code	Cause
1-1-2	Microprocessor register failure
1-1-3	NVRAM read/write failure
1-1-4	ROM BIOS checksum failure
1-2-1	Programmable interval timer failure
1-2-2	DMA initialization failure
1-2-3	DMA page register read/write failure
1-3	Video Memory Test failure
1-3-1 through 2-4-4	Memory not being properly identified or used
3-1-1	Slave DMA register failure
3-1-2	Master DMA register failure
3-1-3	Master interrupt mask register failure
3-1-4	Slave interrupt mask register failure
3-2-2	Interrupt vector loading failure
3-2-4	Keyboard Controller Test failure
3-3-1	NVRAM power loss
3-3-2	Invalid NVRAM configuration

Knowledge Check (1 of 2)

How many distinct stages are there in the boot process?

Make your selection, and click **DONE** when you are finished.

A) 2

B)

C) 4

D) 5

Correct!

Knowledge Check (2 of 2)

True or false: The majority of diagnostic LED patterns do not have a one-to-one relationship with individual POST tests.

Make your selection, and click **DONE** when you are finished.

- (A) True
- (B) False

Correct!

Review (1 of 2)

BIOS stands for Basic Input Output System.

The BIOS is stored in a **CMOS chip**.

The **System Setup Utility** provides a user interface for the BIOS that you can use to manipulate BIOS settings.

You can access the System Setup by pressing the **F2** key.

Users can **password-protect the BIOS** with a system password or an administrator password.

BIOS security is enabled or disabled with a jumper on the system board.

You can typically update the BIOS by downloading a BIOS update, executing it, and rebooting the machine.

Review (2 of 2)

The BIOS boot sequence typically follows these steps:

1. BIOS receives power from the power supply board.
2. BIOS performs the POST.
3. BIOS locates the video chip and runs the built-in BIOS program.
4. BIOS performs other system tests, including memory count.
5. BIOS inventories the system hardware.
6. Depending on the BIOS, a system configuration summary screen is presented.
7. BIOS locates a boot drive.
8. The operating system begins booting.

The boot process consists five distinct stages:

- Off
- Power
- Pre-POST
- POST
- Boot

The **power button LED** changes state to reflect the transition through the boot process.

The **diagnostic Quad-Pack** shows the system's state during the boot process by using a series of LEDs.

Beep codes and error messages provide information about problems that might occur during the boot process.

The Diagnostic Feature Set

Objectives

Here, you will learn about the various diagnostic features that can help you during the troubleshooting process, including beep codes, error messages, and LEDs.

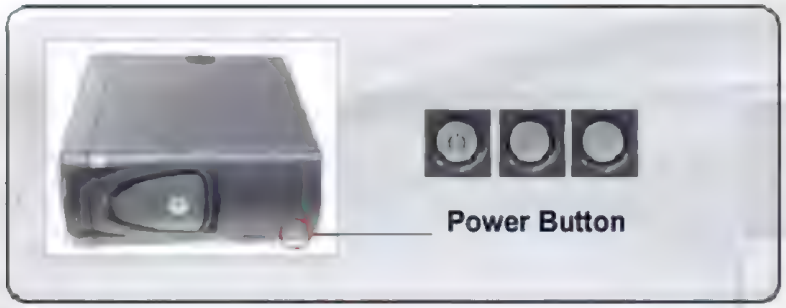
After completing this topic, you will be able to identify the Dell diagnostic feature set.

Diagnostic Feature Set

The diagnostic features of Dell Desktop and Workstation systems include:

Click the ***Forward*** button to learn more.

- Beep codes
- Error messages
- LED Quad-Pack
- Power LED



Diagnostic LEDs and the Quad-Pack

Light Emitting Diodes (LEDs) are small, efficient light sources. They are semiconductors that radiate light.

By decoding the pattern of light, you can troubleshoot a failed system or follow a system through the stages of the boot process.

The diagnostic LED Quad-Pack is one of the key diagnostic features of the Dell OptiPlex Desktop and Precision Workstation systems. It can be used in the event of a system failure during the POST process to assist the fault diagnosis. The Quad-Pack is found in one of these locations:

- Under the front panel door.
- On the front of the chassis between or below the headphone jack and the USB ports.
- On the rear of the system above the mouse and keyboard ports.

Beep Codes

When errors that cannot be reported on the monitor occur during the POST process, your system may emit a beep code to communicate the problem. A beep code is a specific series of sounds.

For example, a Workstation T7400 beeps once, pauses, beeps again, and then beeps three times. This beep code indicates an NVRAM read/write failure.

Beep codes are relatively consistent across platforms. So the 1-1-3 code would still indicate an NVRAM failure on the Dell OptiPlex 210L and the OptiPlex 330. But a Vostro 400 uses a completely different set of beep codes.

Vostro Beep Codes and Error Messages

As with OptiPlex and Precision systems, Vostro systems also report conditions that arise during the POST process through the following methods:

Click each method to learn more.

Text Error Message	Text Error Message	Meaning
	CMOS CHECKSUM ERROR	Possible system board failure or RTC battery low. Replace or reseat the battery.
	CPU FAN FAILURE	CPU fan failure. Check the power connection before replacing the fan.
	HARD-DISK DRIVE FAILURE	Possible hard drive failure during the HDD POST. Check the cables and swap hard drives.
Beep Codes (Repetitive short beeps)	NO TIME TICK INTERRUPT	Possible chip malfunction on the system board or system board failure.
	NOT a boot diskette	Remove any disks from the system or swap with valid bootable media.
	USB OVER CURRENT ERROR	A device on the USB bus is drawing more current than is supported. Disconnect the USB device or use an external power source for the device.

Knowledge Check

True or false: Beep codes are consistent across all Dell systems.

Make your selection, and click **DONE** when you are finished.

A True

B False

Correct!


Diagnostic Tools

Objectives

You can use Dell Diagnostics software to learn more about your system configuration and about crashes that result from faulty driver configuration.

After completing this topic, you will be able to identify and employ the applicable software diagnostic tool, including the relevant options, for specific and general failure events.

Sources for Dell Diagnostic Tools

New Dell platform releases are accompanied by a Graphic User Interface (GUI) diagnostic application, whereas older systems shipped with the DOS-based equivalent. The diagnostic application can test all major hardware components and their functions.

The software is available from the following three resources:

- The Dell *Resource CD* that comes with all platforms.
- The Dell support website at support.dell.com.
- The system partition, a 32-MB partition, placed on your hard drive during the manufacturing process.

Note: You can access the 32-MB system partition by using the one-time boot menu. For this, press **<F12>** during the power-on phase to activate the one-time boot menu, and then follow the prompts that appear on the screen. However, when systems are imaged or the hard drive is replaced, the partition will be overwritten and will not be present.

The Diagnostic Process

You can access the diagnostic application by booting to the *Resource CD* and making the appropriate selections from the displayed menu.

The diagnostic process follows these steps:

1. The Dell logo appears on the screen followed by a message informing you that the application is being loaded.
2. A program tests the RAM that will be used by the diagnostic tools before it is loaded into the memory.
3. The *Resource CD* checks the BIOS for version and setup information.
4. The diagnostic application then scans the hardware present, which it uses to ensure that the application tests a valid configuration.

Why Use the Diagnostic Tool?

There are many reasons to use the Diagnostics tool.

Click each tab to learn more.

General Health Check
Intermittent errors
As an indicator

General Health Check

The 32-bit Diagnostics tool serves as a useful tool when attempting either to test a specific component, or to perform a more general system health inspection. Error messages received can help pinpoint component failures, whether there is an absolute failure or the device is operating outside of normal parameters.

Why Use the Diagnostic Tool?

There are many reasons to use the Diagnostics tool.

Click each tab to learn more.

General Health Check

Intermittent errors

As an indicator

Intermittent Errors

In general, if a user is experiencing intermittent or "strange" errors, system freezes, or questionable response times (vague conditions), it is advisable to run the diagnostics. If the diagnostics pass with no reported errors, you can shift the troubleshooting efforts towards the software environment.

Why Use the Diagnostic Tool?

There are many reasons to use the Diagnostics tool.

Click each tab to learn more.

General Health Check

Intermittent errors

As an indicator

As an Indicator

The software diagnostics should always be used as an indicator only. They cannot be used as a substitute for direct hardware testing. It is imperative that all error code information reported by the 32-bit Diagnostics tool be included in the online service request to Dell.

The Resource CD

The *Resource CD* will run automatically when placed into the drive, if the operating system allows this.

You can use the *Resource CD* to:

- Install drivers, disk utilities, and applications (diagnostic- or performance-based).
- Help in identifying the various chips present on your system along with their manufacturer and type.
- Run the 32-bit Diagnostics tool.

Note: The information on the *Resource CD* may be outdated, so it is recommended that you frequently check the support site's Drivers and Downloads page for the most up-to-date drivers and utilities.

Running the Diagnostics Process from the Resource CD

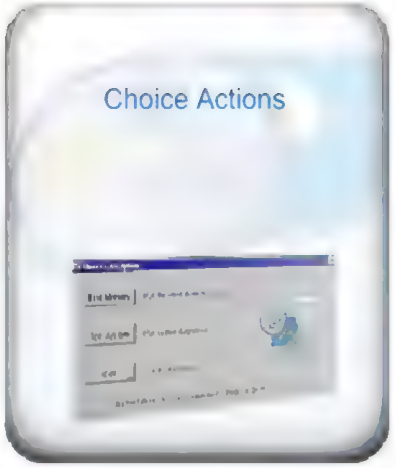
Follow this process to run Dell Diagnostics from the *Resource CD*:

Click each step to learn more.

1. Boot the system with the *Resource CD* inserted in the drive.

2. Press **<F12>** when prompted during start-up. This displays the one-time boot menu.

3. To prepare the system to run the diagnostics, select the **Boot from CD -ROM** option from the Startup menu.



4. To begin system diagnostics, select the **Run the 32 Bit Dell Diagnostics** option from the **Choice Actions** menu if prompted.

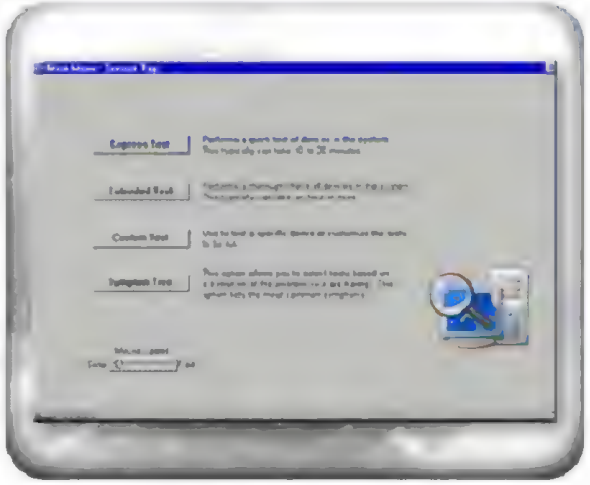
Running the Diagnostics Process from the System Partition

All factory-shipped Dell systems include, as part of the default specification, the 32-bit System Diagnostics, hidden on a utility partition.

Note: Drives sent for service replacement will be unformatted. As a result, the utility partition will not be included. The capability to run the 32-bit Diagnostics will also be absent.

The following steps show how the diagnostics are run. *Click each image to learn more.*

1. Press **<F12>** while the system boots to access the diagnostic tool. Select Diagnostics from the boot menu and press **<Enter>**.



2. The tool loads the appropriate modules, and the standard Dell Diagnostics main menu appears.

3. When you choose to exit the diagnostic tool, the system will reboot according to the normal boot sequence and return to the installed operating system, if applicable.

Features Available in the Diagnostic GUI

With the diagnostic GUI utility program you can:

- Perform express, extended, or custom tests on one or all devices.
- Select tests based on the problem that your system reports.
- Choose the number of times a test is to be run.
- Display test results.
- Terminate testing if the number of errors exceeds a predefined number.
- Receive status messages that indicate whether tests have completed successfully.
- Receive error messages if problems are detected.

What Are the GUI Diagnostic Tools?

You are provided with the following four choices when you run the first screen of the new diagnostic utility:

- Express Test
- Extended Test
- Custom Test
- Symptom Tree

*Click **Forward** to learn more about each of these.*

What Are the GUI Diagnostic Tools?

You are provided with the following four choices when you run the first screen of the new diagnostic utility:

- Express Test
- Extended Test
- Custom Test
- Symptom Tree

*Click **Forward** to learn more about each of these.*

Express Test

- Runs a quick test on all components in the system.
- Finds obvious faults.
- Has an approximate run-time of 30 minutes.

What Are the GUI Diagnostic Tools?

You are provided with the following four choices when you run the first screen of the new diagnostic utility:

- Express Test
- Extended Test
- Custom Test
- Symptom Tree

*Click **Forward** to learn more about each of these.*

Extended Test

- Runs in-depth tests on all components in the system.
- Tests components at the extremes of their parameters.

What Are the GUI Diagnostic Tools?

You are provided with the following four choices when you run the first screen of the new diagnostic utility:

- Express Test
- Extended Test
- Custom Test
- Symptom Tree

*Click **Forward** to learn more about each of these.*

Custom Test

- Runs in-depth tests on the individual components that you select.
- Helps to tailor the tests you run. Use this option when you receive error code information highlighting a potentially faulty part or you have a suspicion based on the system's behavior that you want to validate.

What Are the GUI Diagnostic Tools?

You are provided with the following four choices when you run the first screen of the new diagnostic utility:

- Express Test
- Extended Test
- Custom Test
- Symptom Tree

*Click **Forward** to learn more about each of these.*

Symptom Tree

- Is useful if you are not sure which component is suspected to be failing but know the symptom that it is producing.
- Tests all hardware components that can cause a particular symptom.

MpMemory Diagnostics

On some systems, a new memory diagnostic test referred to as MpMemory (multiple processor memory) has been added.

Knowledge Check (1 of 2)

True or False: The Dell *Resource CD* can help in identifying the chipset present on your system, but has no added value in terms of diagnosing system faults.

Make your selection, and click **DONE** when you are finished.

A) True

B) False

Correct!

Knowledge Check (2 of 2)

Which of the following tests run in-depth tests on all components of the system?

Make your selection, and click **DONE** when you are finished.

A Express Test

B Extended Test

C Custom Test

D Symptom Tree

Correct!

Review

Dell systems include standard **diagnostic features**:

- Beep codes
- Error messages
- LED Quad-Pack
- Power LED

The LED Quad-Pack is featured on the Dell OptiPlex and Precision Workstation systems. Vostro systems currently shipping do not have this feature.

Use **Dell Diagnostics** to test a specific hardware component or perform a general system health inspection.

The diagnostics software can be run from the CD or the hard drive.

Use the **Resource CD** to install drivers, disk utilities, and system applications.

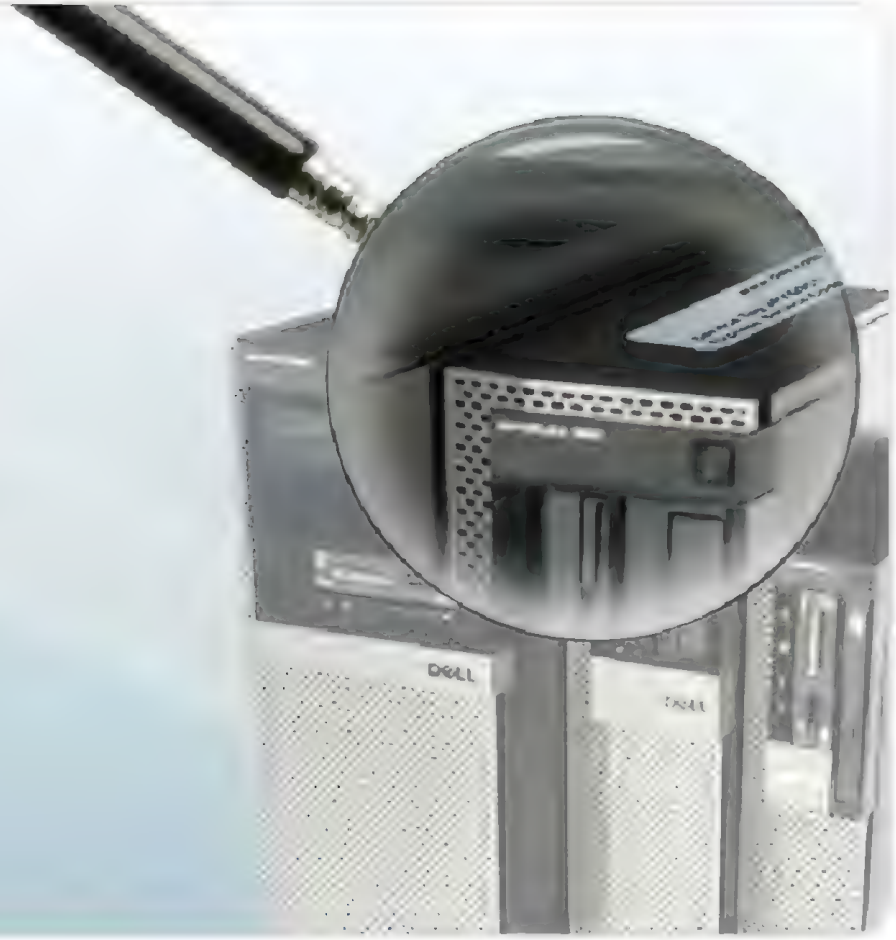
The **Diagnostics GUI application** reports status messages and error messages that indicate test results.

There are four **menu options** for the GUI Diagnostics tool:

- Express Test
- Extended Test
- Custom Test
- Symptom Tree

The **Dell Crash Analysis Tool** identifies driver and software problems on Dell systems.

System Identification



Objectives

In this topic, you will learn about the very first stage for troubleshooting: the fundamentals of tracking equipment during service calls.

After completing this topic, you will be able to locate and update the service tag, create an asset tag, and locate serial numbers for components.

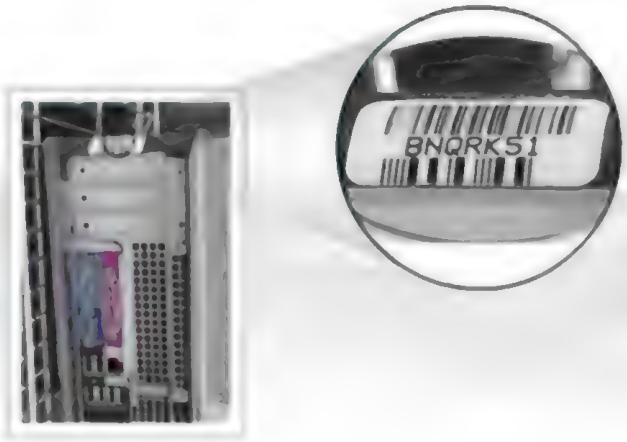
The Service Tag

A **service tag** is the name given to the serial number of a Dell system, printer, projector, or PDA. It is a unique seven-digit alphanumeric string defined at Dell that is set by Dell before the system leaves the factory.

The service tag is displayed in two locations:

- In the BIOS
- On a sticker placed on the outside of the chassis

Note: When replacing a system board, be sure to update the service tag information in the BIOS to match the service tag on the chassis. It is also a good practice to flash the BIOS to the most recent version at this time.



Location of the Service Tag

A service tag can be physically located in these places:

Click each to learn more.

- On the top of the chassis towards the front.

- On the bottom of the chassis towards the back.

- Under the front panel of older chassis.

Uses of the Service Tag

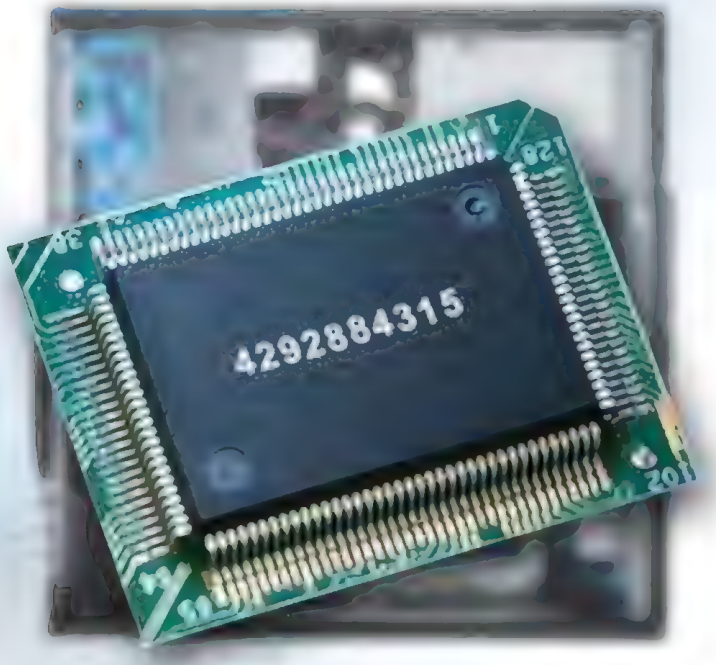
A service tag is used:

- As a system identifier.
- For speedy system identification when browsing the support site.
- To identify the system requiring warranty service. It must be provided for any hardware dispatches.

Failure to maintain a consistent service tag both in the BIOS and on the chassis sticker can potentially cause confusion when placing warranty calls, overwriting master passwords, or controlling your install base. It is therefore recommended that you ensure the original tag number is maintained throughout the life of the system. Always remember to update the service tag in the BIOS after a system board replacement.

Note: If a warranty request is submitted to Dell using a service tag different than the one on the machine with the fault, a Dell engineer who performs a mandatory check of the tag information may not complete the repair.

Asset Tags



An **asset tag** is a customer-specified number, up to 10 digits long, that can optionally be used as a system identifier. It can be used to facilitate company security and control policies or for auditing purposes.

The asset tag can be stored in the BIOS by using the **Asset Tag Utility**. This utility:

- Is available along with software support utilities in the *Resource CD*.
- Can be downloaded from the Dell support site ftp.dell.com/utility/. The file is called **ASSET_A209.COM** and must be run in a DOS environment.

Note: Running **asset_a209 /?** in a DOS environment will list the commands that can be used with this utility.

Running the Asset Tag Utility

There are two ways to run the Asset Tag utility. *Click each method to learn more.*

With Resource CD

1. Place the *Resource CD* in the CD-ROM drive and press **F12** on boot to get to the one-time boot menu.
2. Select **CD-ROM** from the boot options.
3. Use the menu options on the *Resource CD* to enter a DOS environment (or just quit the diagnostics).
4. At the DOS prompt, type "**cd CSD\TOOLS\BIOS**".
5. The Asset file should be present when you type "**dir**" to view the directory contents.
6. Type "**<asset> xxxxxxxxxx**" where <asset> is the file name of the utility present on your disk, and xxxxxxxxxx is the desired asset tag.

Without Resource CD

1. Obtain a DOS boot disk. Dell provides the *Resource CD* that can be used for this but isn't the only option.
2. Download the Asset utility from ftp.dell.com/utility/Asset_A209.COM and save it to a CD-ROM, floppy drive, USB key, or any form of media that is detected by your preferred boot disk that will enter a DOS environment. Not all DOS boot media will detect different forms of media, so you will need to confirm this beforehand.
3. Boot to the DOS environment and browse to the folder you saved the Asset Utility in or insert the other medium that you saved it to.
4. Type "**<asset> xxxxxxxxxx**" where <asset> is the file name of the utility present on your disk, and xxxxxxxxxx is the desired asset tag.

Serial Numbers for Other Components

A **serial number**, which is a 20-digit PPID (piece part identification number), is required to advance a service request or to replace the following components:

Note: When contacting Dell to replace CRTs, flat panel displays, batteries, AC adapters, speakers, and docking stations, you must provide the PPID. Failure to log the PPID may prevent the service request from being completed.

CRT monitors

Flat panels

Serial Numbers for Other Components

A **serial number**, which is a 20-digit PPID (piece part identification number), is required to advance a service request or to replace the following components:

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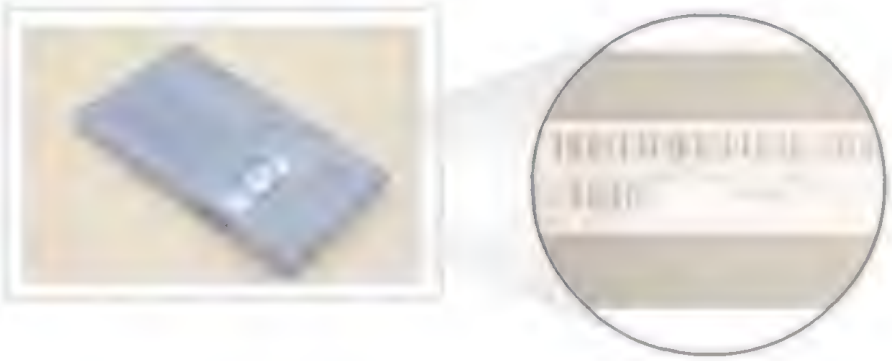
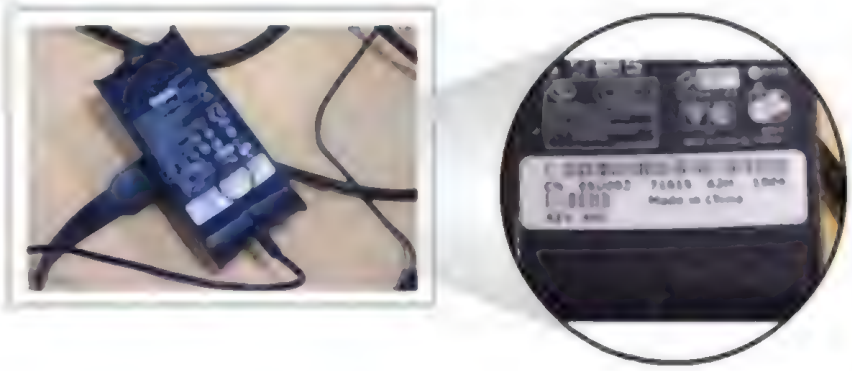


Batteries



AC adapters

Serial Numbers for Other Components

A **serial number**, which is a 20-digit PPID (piece part identification number), is required to advance a service request or to replace the following components:

Note: When contacting Dell to replace CRTs, flat panel displays, batteries, AC adapters, speakers, and docking stations, you must provide the PPID. Failure to log the PPID may prevent the service request from being completed.

Speakers

Docking stations

Knowledge Check (1 of 2)

True or False: An asset tag is a customer-programmable number, which can be used to facilitate security policy and/or audit information.

Make your selection, and click **DONE** when you are finished.

- (A) True
- (B) False

Correct!

Knowledge Check (2 of 2)

If a warranty request was submitted to Dell using a service tag different than the one on the machine with the fault, would a Dell engineer who performs a mandatory check of the tag information complete the repair?

Make your selection, and click **DONE** when you are finished.

A

B No

Correct!

Fault Identification

Objectives

The first step of the troubleshooting process is to identify the type of failure that has occurred.

After completing this topic, you will be able to classify Dell system failures.

Troubleshooting by Identifying Faults

The first step to troubleshooting any problem is to categorize the stage of failure, which can be one of the following four types. *Click each fault to learn more.*

Note: After classifying the category of a system failure, you need to take decisive steps towards identifying the components that are responsible for the failure. This task is made easier with the Dell diagnostic feature set, such as system LEDs and other error-code information. Additionally, you should, whenever possible, refer to support.dell.com by using the category failure as a search string, such as "GX280 No POST" or "GX280 No Power" or "GX280 No Boot."

No Power

Occurs when power is applied but the system does not receive a supply or circulate it correctly.

No Pre-POST

Occurs when the system fails any part of pre-POST.

No POST

Occurs when the system fails any part of POST.

No Boot

Occurs when the system fails to boot. This happens when a failure occurs after the BIOS has handed control of the boot process over to the operating system kernel.

Identifying Faults

Depending on the type of fault you encounter, the steps for troubleshooting can vary. *Click each fault type to learn more about troubleshooting it.*

Identifying the No Power Fault	**Identifying the No Power Fault** You can determine the power state of a desktop system by checking the conditions of the following indicators and components: • **Power LED**: Whether the power LED is off, green, amber, blinking, or steady. • **Flea power indicator**: Whether the flea power LED on the system board is on. • **System fan**: Whether the power supply fan is turning. • **LED Quad-Pack**: Would be off for a potential No Power.
Identifying the Pre-POST Failure	
Identifying the POST Stage Failure	
Identifying the Boot Stage Failure	

Identifying Faults

Depending on the type of fault you encounter, the steps for troubleshooting can vary. *Click each fault type to learn more about troubleshooting it.*

Identifying the No Power Fault	**Identifying the Pre-POST Stage Failure** To identify a pre-POST failure, check the status of the following: • Does the Power LED show solid amber? • Is the LED Quad-Pack blank? • Is there a beep code?
Identifying the Pre-POST Failure	
Identifying the POST Stage Failure	
Identifying the Boot Stage Failure	

Identifying Faults

Depending on the type of fault you encounter, the steps for troubleshooting can vary. *Click each fault type to learn more about troubleshooting it.*

Identifying the No Power Fault	**Identifying the POST Stage Failure** You can determine whether your system has failed during the POST routine hardware tests by checking the following conditions: • Is the system receiving power? • Is the power LED off, green, amber, blinking, or steady? • Is the flea power LED on the system board on? • Is the power supply fan turning? • What status and/or error code information is displayed by the LED Quad-Pack? **Note:** To determine the components that should have been tested and initialized during the POST routine checks, you need to record any displayed LED codes and translate the associated meaning. This information is available in the appropriate online system manual. For any failure, you must include the LED patterns displayed in your online warranty request log to Dell.
Identifying the Pre-POST Failure	
Identifying the POST Stage Failure	
Identifying the Boot Stage Failure	

Identifying Faults

Depending on the type of fault you encounter, the steps for troubleshooting can vary. *Click each fault type to learn more about troubleshooting it.*

Identifying the No Power Fault	**Identifying the Boot Stage Failure** Booting a system is defined as loading and passing control of the boot process to the operating system kernel. The kernel is the first piece of software required to display the Windows login screen. You can determine if your system is failing to boot properly by checking the following conditions: • Has the system successfully powered on? • Has the system passed the initial POST checks? • Are you receiving a video signal on the monitor? • Is there an error message on the monitor? • Is there any bootable media loaded? **Note:** If you are receiving a video signal on the monitor, a solid green power LED indicator and a GGGG or GGGY on the Quad-Pack, there is a high probability that you are not going to need to troubleshoot this issue as a no POST. GGGG signifies that the system has successfully completed all POST checks and GGGY indicates system activity subsequent to video initialization.
Identifying the Pre-POST Failure	
Identifying the POST Stage Failure	
Identifying the Boot Stage Failure	

Knowledge Check

Which of the following are stages of failure? (Select all that apply.)

Make your selection, and click **DONE** when you are finished.

- (A) No Power
- (B) [illegible]
- (C) No POST
- (D) No Boot

Correct!

Review

A **service tag** is a unique seven-digit alphanumeric string defined at Dell and stored in the BIOS and on a sticker attached to the outside of the chassis.

The **service tag** is required for placing warranty calls.

An **asset tag** is an optional customer-specified number that can be up to 10 digits long.

Use the **Asset Tag Utility** to store the asset tag number in the BIOS.

Run the Asset Tag Utility from the *Resource CD* or download it from ftp dell com/utility/Asset_A209 COM.

A **serial number** is a 20-digit piece part identification number that is required for various components to advance a service request.

The first step in troubleshooting is to categorize the stage of the failure:

- No power
- No pre-POST
- No POST
- No boot

Troubleshooting Power

Objectives

In this topic, you will learn about techniques for troubleshooting power-related faults.

After completing this topic, you will be able to identify power -related faults, and follow guidelines for the successful troubleshooting of power-related faults.

Troubleshooting Environment-Related Power Faults

To troubleshoot a suspected power issue, first you need to verify whether the fault is related to environmental components, such as the external power source and intermediary or connecting devices. To do this:

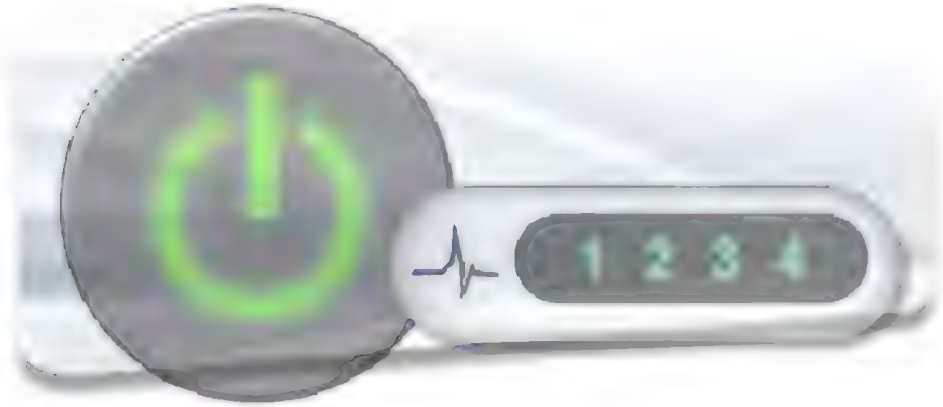
- Verify the external power source or wall socket.
- Verify the intermediary or connecting devices such as extension cords or surge suppressors.

This verification is performed through part substitution and/or testing with known good devices on the same outlet or connecting device.

Troubleshooting Power Outside the Chassis

Try a few simple troubleshooting steps before opening the chassis.

Click ***Forward*** to learn more.



- Check the status of the power LED and the LED Quad-Pack (on systems that have one).

- Determine whether the power supply fan is spinning.

Note: It is never recommended that you insert objects into the power supply fan to determine if it is spinning or the source of excess noise.

Troubleshooting Power Outside the Chassis

Try a few simple troubleshooting steps before opening the chassis.

Click ***Forward*** to learn more.

- Reseat the power cord.

- If the system has a switchable power supply, unplug the power cord and rock the switch to the incorrect position and then back to the correct setting for your region.

Note: Many power supplies are auto sensing and may not have a voltage switch.

Troubleshooting Power Outside the Chassis

Try a few simple troubleshooting steps before opening the chassis.

Click ***Forward*** to learn more.

- Try the power cord from a working system or display.

- Ensure that the bezel is aligned correctly. Improper bezel alignment may prevent the power button from activating the system.

Troubleshooting Power Inside the Chassis

If the problem persists after checking environmental and external system causes, you need to check the possible internal causes. To do this:

- Open the case and perform a visual inspection of the system board and its components for abnormalities that could have an impact on the system's ability to power on.
- Check the status of the flea power light, components that may be disconnected, and cables or connectors that may be incorrectly seated.
- Check the power connections to the system board and whether the processor fan or any expansion card fans are spinning. Failure of the fans to spin may indicate a power failure or fan failure and would need to be examined further.
- Reseat the power connection to the system board, and then disconnect all power connectors to the drives. A power failure or short in any device can be the cause of a no POST. Removing the power connectors will rule these out as a possible problem if the issue persists.
- Reseat the cable that connects the I/O panel to the system board on both ends.
- If you think the I/O panel may be the cause of a no POST, unplug the power to the system. Unplug the I/O panel from the system board and remove the CMOS battery. Plug the system power back in; after a few moments the system should POST on its own if everything else is functional. If you can boot the system this way but not with the I/O panel connected, then it is the likely cause.

Note: Remember the fundamental principle and objective of any troubleshooting methodology is cause and effect. We are looking to identify that action (cause) that results in a change (effect) of symptoms or error-code information. For example, a scorched component would visibly appear as if it has been burned, either through exposure to heat or a sudden and uncontrolled burst of power. If this is the case, you would need to call Dell support for additional advice.

Checking Internal Components

At this stage, if you have not identified the reason for the failure to power on, the fault could be due to a failing component. The troubleshooting checks could include:

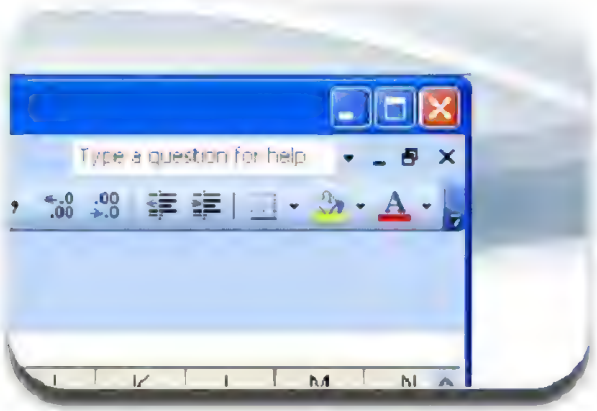
- Remove all components and devices, such as the drives, drive data cables, expansion cards, riser, and audio and Molex cables that do not prevent the system from receiving power.
- Test the system with cause and effect in mind and focus your attention on the remaining components, such as memory, power supply, **voltage regulator module** (VRM), and processor.
- Test the memory modules in isolation and in different slots, swapping them with known good memory modules if possible.
- Remove the second processor and the VRM, if applicable. Test each processor individually. Use substitute parts if necessary.
- Swap the power supply with a known good **power supply unit** (PSU) or utilize a power supply tester.

Note: If the system has two processors and a separate VRM, you must also remove the second processor if you need to remove the VRM. Always check your system's *User's Guide* or *Service Manual* for specific instructions.

Troubleshooting Sleep States: Not Entering Sleep State

To troubleshoot a system that does not enter a sleep state, determine what might be causing the failure:

Click each component to learn more.



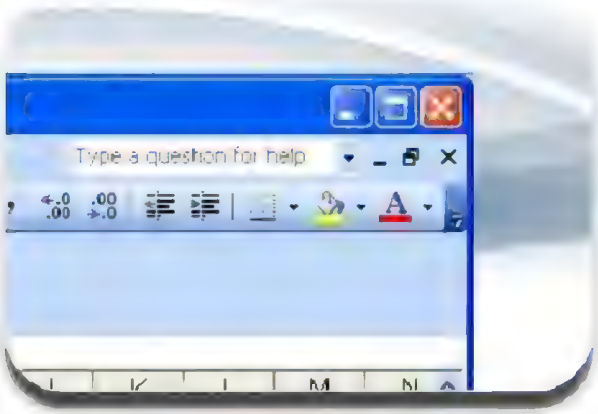
To determine if an **application** is preventing the system from entering a sleep state:

- Individually close all applications running in the foreground or background, including System Tray (Notification Area) applications.
- Remove applications from the Start Up locations and restart the system.
- If the system enters sleep mode, individually add the Start Up applications and test.

Troubleshooting Sleep States: Not Entering Sleep State

To troubleshoot a system that does not enter a sleep state, determine what might be causing the failure:

Click each component to learn more.



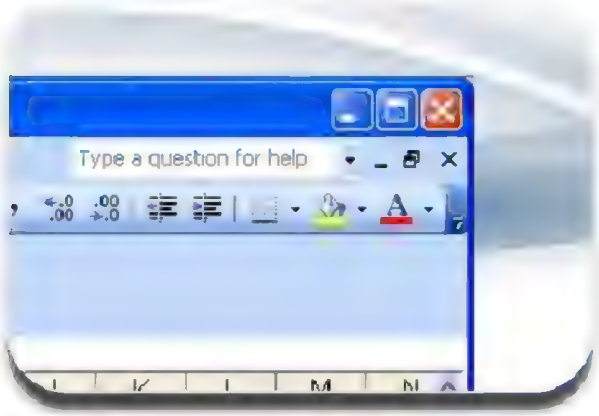
To determine if a **peripheral** or its driver is preventing the system from entering a sleep state:

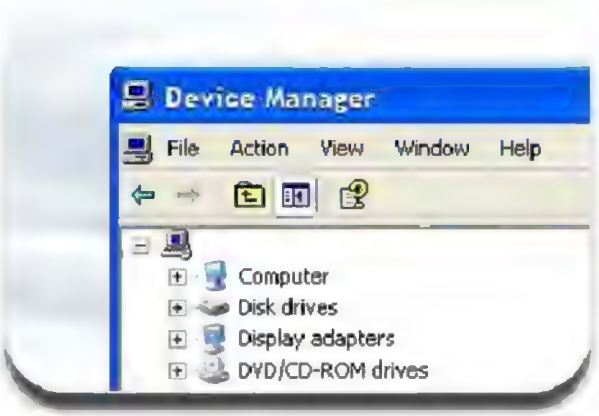
- Check the *User's Guide* or *Service Manual* for the peripheral to determine if it supports sleep states.
- Note that any peripheral attached to the system may prevent the system from entering a sleep state.

Troubleshooting Sleep States: Not Entering Sleep State

To troubleshoot a system that does not enter a sleep state, determine what might be causing the failure:

Click each component to learn more.





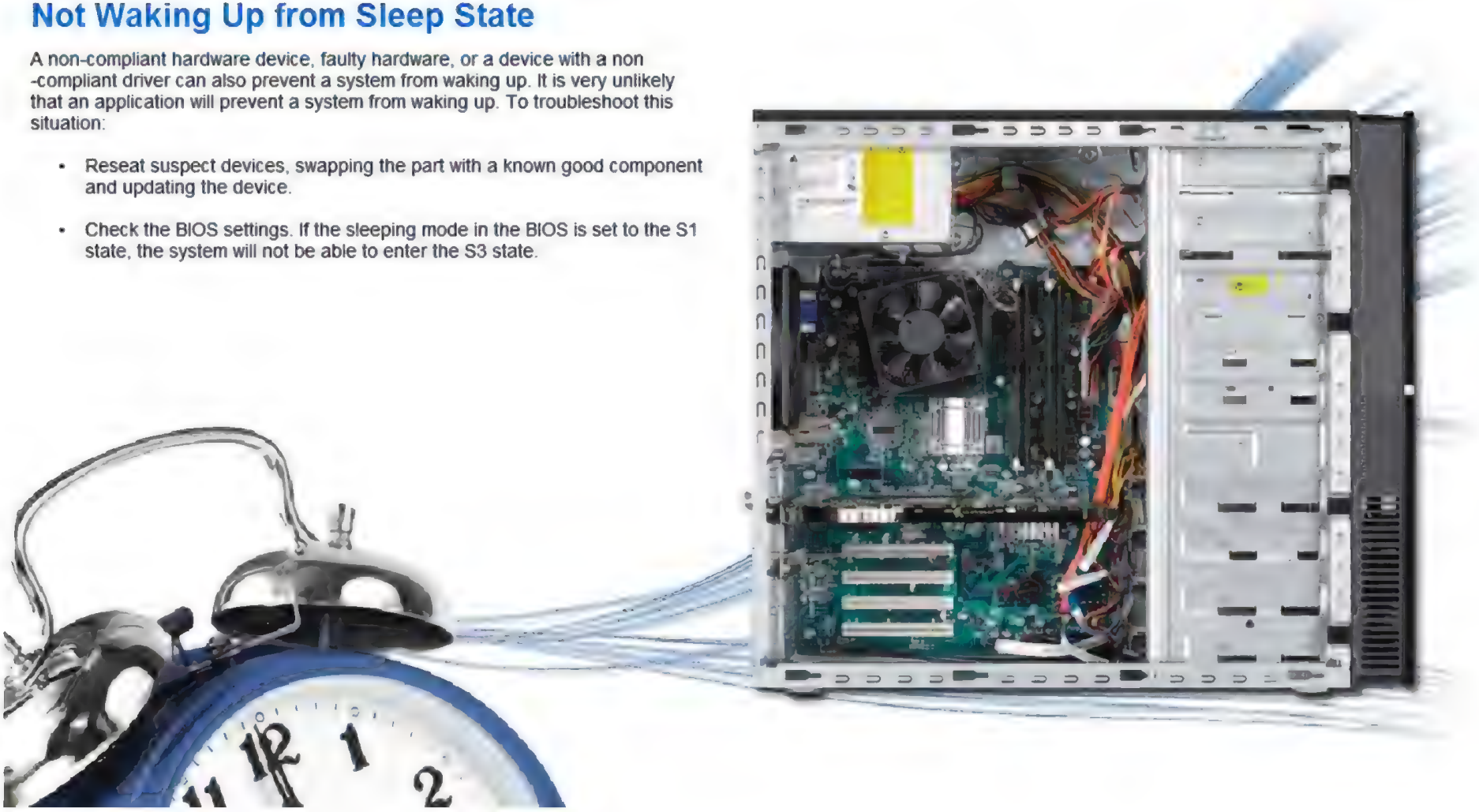
To determine if an **operating system setting** is preventing the system from entering a sleep state:

- Check for Operating System settings that may not be configured correctly.
- On a Windows-based system, errors in the Device Manager can prevent S3 sleep.

Not Waking Up from Sleep State

A non-compliant hardware device, faulty hardware, or a device with a non -compliant driver can also prevent a system from waking up. It is very unlikely that an application will prevent a system from waking up. To troubleshoot this situation:

- Reseat suspect devices, swapping the part with a known good component and updating the device.
- Check the BIOS settings. If the sleeping mode in the BIOS is set to the S1 state, the system will not be able to enter the S3 state.



Knowledge Check (1 of 3)

True or False: The state of the power button LED can indicate the point or stage at which the POST routine of a system failed.

Make your selection, and click **DONE** when you are finished.

A) True

B) False

Correct!

Knowledge Check (2 of 3)

True or False: Text error messages can provide information about a previous boot failure.

Make your selection, and click **DONE** when you are finished.

A) True

B) False

Correct!

Knowledge Check (3 of 3)

True or False: The best way to determine if the power supply fan is spinning is to insert a pencil into the power supply.

Make your selection, and click **DONE** when you are finished.

A True

B False

Correct!

Troubleshooting Pre-POST

Objectives

In this topic, the pre-POST components are reviewed, and you will learn about the steps for troubleshooting pre-POST failures.

After completing this topic, you will be able to follow the guidelines for troubleshooting pre-POST.

Causes of Pre-POST Failures

A system failure can be categorized as a **pre-POST stage failure** if the system cannot process the software code stored in the BIOS.

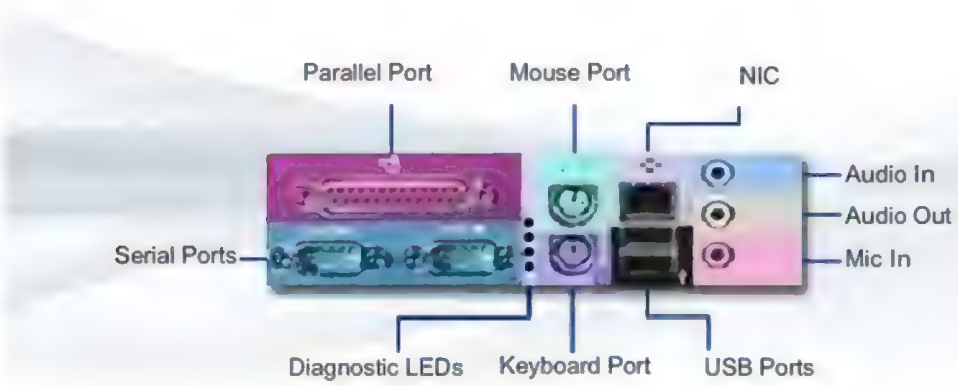
Possible causes of this failure are:

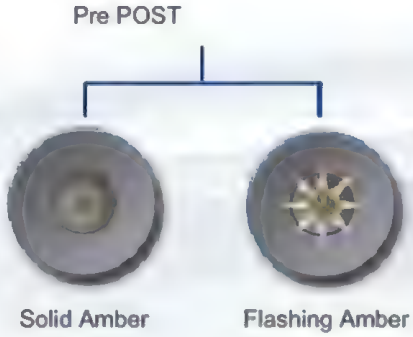
- Processor failure
- System board failure
- Installed components failure

During POST, a system cannot detect or test the memory, **riser**, or any of the integrated components without executing the BIOS code.

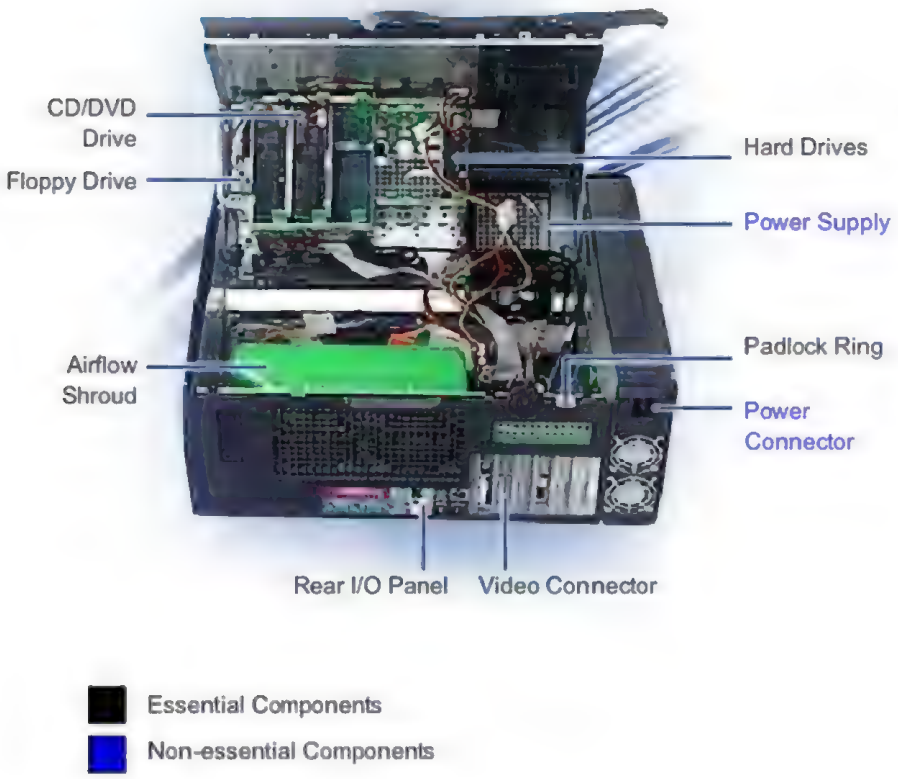
Physical seating issues with components, such as an incorrectly seated memory module or cable connector, could cause the system to fail pre-POST due to a short in the electric circuit.

Note: Both blinking amber and solid amber would be a Pre-POST failure.





Pre-POST Components



A pre-POST failure can be of the following two types:

Essential component failure:

This is due to failure of components that are required for the system to process data at the most basic level. This includes the power supply, the system board, the processor, and the voltage regulator module (VRM).

Non-essential component failure:

This is due to failure of components that are not required for the system to process data at the most basic level. This includes the riser, expansion cards, memory modules, data cables, drive power cables, audio and Molex cables, processor fans, and system case fans.

Note: On most systems, the VRM is embedded in the system board. Some systems that have two processors also have a discrete VRM. On these systems, you must also remove the VRM when removing the second processor during troubleshooting.

Steps for Troubleshooting Pre-POST Failures

Follow these steps for troubleshooting pre-POST failures:

Click each step to learn more.

Step 1: Checking the obvious	**Step 1** **1. Remove all peripherals.** Remove all externally connected peripherals or devices. Test the system, and if the symptoms change, note that one of those components could be responsible for the fault. Add components back individually to isolate the offending part. **2. Reseat the system processor(s) and VRM.** Open the case and reseat the processor, using the Dell recommended procedure. Test the VRM and second processor, if applicable, through reseating, removal, or substitution (if resources permit). Test the system.
Step 2: Checking internal drives, cables and connection points	
Step 3: Swapping components	

Steps for Troubleshooting Pre-POST Failures

Follow these steps for troubleshooting pre-POST failures:

Click each step to learn more.

Step 1: Checking the obvious

Step 2: Checking internal drives, cables and connection points

Step 3: Swapping components

Step 2
If all the efforts thus far have produced no result, attempt to isolate or verify the functionality of drives, cables, and connection points.

1. Reseat the power supply connection to the system board.
2. Remove all power and data connections to the system board. Remove all drives and test the system.
3. Reseat the cable to the I/O panel and test the system.
4. Verify the seating of all connections.

NOTE: You can test the I/O panel by doing the following: Unplug the power to the system. Unplug the I/O panel from the system board and remove the CMOS battery. Plug the system power back in and see if the system will POST without the I/O panel. If so, the I/O panel is a likely point of failure.

Steps for Troubleshooting Pre-POST Failures

Follow these steps for troubleshooting pre-POST failures:

Click each step to learn more.

Step 1: Checking the obvious

Step 2: Checking internal drives, cables and connection points

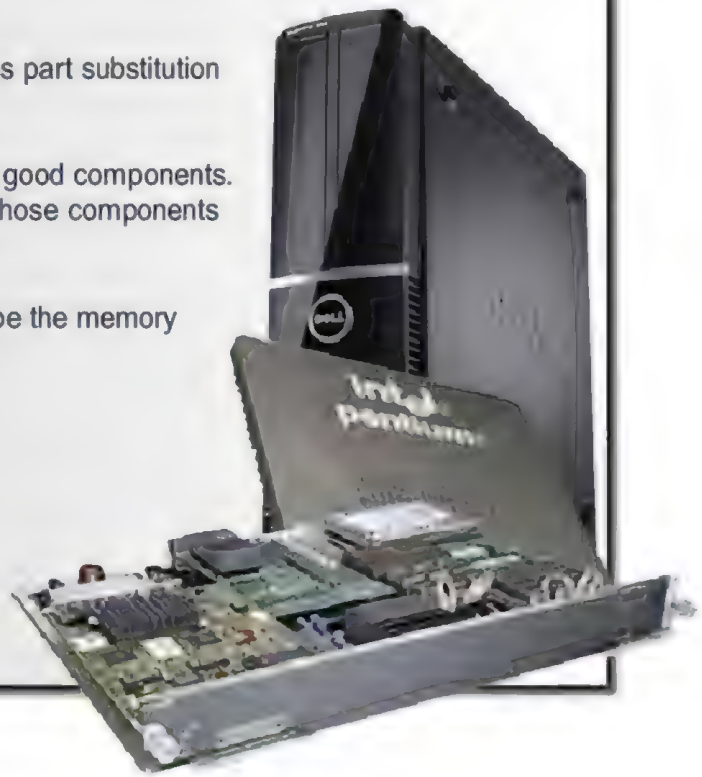
Step 3: Swapping components

Step 3

The last phase of troubleshooting pre-POST failures includes part substitution with known good parts:

1. Swap the remaining components one by one with known good components. Begin with known good expansion cards and continue with those components required for completion of the pre-POST.

2. At this stage, the components referred to would typically be the memory modules and possibly the processor or VRM (if applicable).



Knowledge Check (1 of 3)

Which of the following failures can cause a pre-POST failure? (Check all that apply.)

Make your selection, and click **DONE** when you are finished.

- (A) Processor failure
- (B) System board failure
- (C) Failure of an installed component
- (D) Operating system failure

Correct!

Knowledge Check (2 of 3)

In the case of a pre-POST failure, what will be the status of the power LED?

Make your selection, and click **DONE** when you are finished.

A

B Solid amber

C Blinking amber

D Solid green

E Blinking green

Correct!

Knowledge Check (3 of 3)

Which of the following are essential components in completing the pre-POST phase of a system? (Check all that apply.)

Make your selection, and click **DONE** when you are finished.

- (A) Power supply
- (B) Expansion cards
- (C) System board
- (D) Memory modules
- (E) Data cables
- (F) Processor

Correct!

Troubleshooting POST

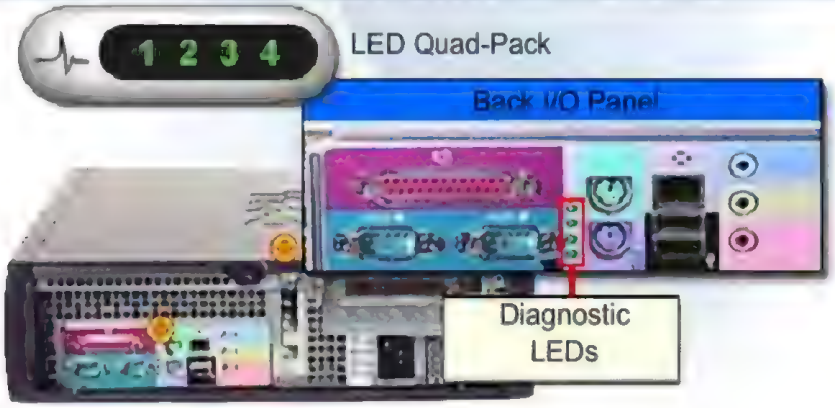
Objectives

Here, you will learn about POST failures and the steps for troubleshooting them.

After completing this topic, you will be able to follow the guidelines for troubleshooting POST failures.

Causes for POST Failures

Code	Cause
1-1-2	Microprocessor register failure
1-1-3	NVRAM
1-1-4	ROM BIOS checksum failure
1-2-1	Programmable interval driver
1-2-2	DAM initialization failure
1-2-3	DAM page register read/write failure
1-3-1 through 2-4-4	DIMMS not being properly identified or used



POST failure occurs when a component or a peripheral fails the POST tests or causes the system to lock up.

You can identify the state of the POST failure, which in turn assists in the isolation of potential failed components, with the help of:

- The Power LED
- Diagnostic LED Quad-Pack codes
- On-screen POST error codes
- Audible beep codes

Note: The LED codes, POST codes, and audio beep codes can be looked up in the online and system-specific manuals with troubleshooting assistance available at support.dell.com. The software code that defines and produces the diagnostic LED Quad-Pack patterns, on-screen POST errors, and beep codes is stored in the flash BIOS code and is read as part of the actual POST routine.

The LED Quad-Pack, Text-based POST Codes, and Beep Codes

You can use POST test routines and error code information to identify the stage at which the POST process has failed or locked, which in turn assists in isolating and identifying whatever components that have potentially caused the POST failure. The following characteristics of the POST process help you achieve this:

- The POST test routines and codes are divided into several distinct phases, which in turn, are based on the components being tested.
- Each portion of the routine is made visible through a Quad-Pack LED pattern. This means that the LED display codes and the changes they cycle through map to the distinct POST phases and components being tested during that phase. You can monitor the POST cycle and the resultant LED changes during each routine.
- Any error code (LED Quad-Pack LED codes, displayed text messages, beep codes, or any combination of these) can help identify the stage of failure.
- As the processor begins executing the actual POST code, it displays an LED Quad-Pack code to indicate the portion of the routine that is currently being executed.
- As one test finishes and the next one begins, the LED Quad-Pack code changes to indicate the next test set.
- If the system encounters a POST failure, you can isolate the cause using the system's User's Guide or Service Manual, as well as the troubleshooting information available at support.dell.com.

Note: Not all systems have an LED Quad-Pack.

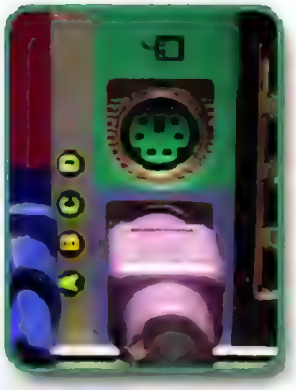
What Do LEDs and Beep Codes Indicate?

The LED Quad-Pack is used to visibly display the system's progress through the POST routines in the following ways:

- As a POST routine executes with obvious pauses for longer tests, the LED Quad-Pack will change to display a different set of codes.
- In the event of a failure, the LED Quad-Pack, text-based errors, and beep codes can be used to indicate the routine where the POST process failed. In conjunction with the online resources, you can use this information to isolate and identify any failed components.
- The LED Quad-Pack and the routine associated code will not change to the next pattern when the system encounters a failure or a lockup during a POST test.
- A **solid green power LED** indicates that the processor has begun processing the POST tests.

Refer to the *User's Guide* or *Service Manual* for your system for the meaning of LED Quad-Pack and beep codes.

Note: When a system has a large amount of memory to test, the memory pattern will be displayed for a longer period before proceeding to the next pattern. A pause in changes shown by the POST LED Quad-Pack does not signify a fault, but indicates that the test cycle is longer.



Diagnostic LEDS

How to Identify Causes of No POST Failures

Power LED	LED Quad-Pack	Beep Code	Identifying the Possible Cause if System Has No POST with These Symptoms
Solid green	Blank	None	
		Beep code	Check the beep code and troubleshoot the indicated component.
	LED code	None	Check the LED code and troubleshoot the indicated component.
		Beep code	Check LED and beep codes and troubleshoot the indicated component.

The status of the power LED, the code displayed by the LED Quad-Pack, the text-based POST codes, and the beep codes help you identify the stage at which the POST failure has occurred. This enables you to identify the potentially faulty component.

You can supplement and validate your understanding of the components tested during that phase with online resources, such as system manuals. These resources include tips and guidance on successful troubleshooting. The power LED is typically solid green during POST.

You do need to be familiar with accessing and navigating through the online resources, as you need to check the LED code and the beep code to identify the POST stage failure, and possible components causing the failure.

Troubleshooting Steps for POST Failures

Follow these steps to troubleshoot POST failures:

Click each step to learn more.

Step 1: Removing components	**Step 1** Check the status of the LED Quad-Pack, power LED, and any other valid error code information after each phase or discrete step of your troubleshooting strategy. This helps in the identification of changes in symptoms caused by your action. You can check the status of LEDs or error codes after removing and testing. • Peripherals connected to the system or the external interfaces: keyboard, mouse, network cables, parallel, serial and USB devices, and the monitor • Non-essential components: Drives and their associated power and data cables, Molex cables, riser cards (if applicable), and expansion cards Removing system memory can also help diagnose problems; however, the system will not complete POST without memory. The idea is to see if the system fails as one would expect, or see if a failure not realted to the memory still appears to exist. **WARNING:** Always read the online service manual for your system before attempting to remove or replace parts, because it contains critical safety information. Additionally, before removing any components, remove the power cable and ensure that the flea power light is drained before proceeding.
Step 2: Checking the power source, the PSU, and its connecting leads	
Step 3: Reseating and substituting components	
Step 4: Removing installed memory modules	

Troubleshooting Steps for POST Failures

Follow these steps to troubleshoot POST failures:

Click each step to learn more.

Step 1: Removing components	**Step 2** To check power supply to the system, you do the following: • Verify that all the connectors were properly seated and that there is no pin damage. • Reseat the power connector to the system board. • Inspect the mother board for visible damage or scorching. • Remove all power connections to installed drives. • Unplug the power to the system. Unplug the I/O panel from the system board and remove the CMOS battery. Plug the system power back in and see if the system will POST without the I/O panel. • Swap the power cord with a reliable one and verify seating of all connections. • Check for damage or bent pins in any connectors. • Verify that a reliable power source is used. If possible, test a known good device at the power point. • Remove all extension cords, power strips, and adapters. **NOTE:** If the failure coincided with a power spike or lightning strike, the repair may not be covered by the warranty. Remember to document everything in your online support request.
Step 2: Checking the power source, the PSU, and its connecting leads	
Step 3: Reseating and substituting components	
Step 4: Removing installed memory modules	

Troubleshooting Steps for POST Failures

Follow these steps to troubleshoot POST failures:

Click each step to learn more.

Step 1: Removing components	**Step 3** Troubleshooting no POST faults through part substitution with known good parts could be the first step you employ in your strategy. Such a strategy may involve: • Swapping those parts not yet tested with known good components. • Swapping the VRM, if applicable, and testing the processor(s). • Reseating or swapping the processor if you are not comfortable removing it. • Swapping the power supply to the system. Troubleshooting in conjunction with guidance available online makes for a more sound and effective methodology. For this, use and refer to the manuals and support.dell.com. Always provide a concise, step-by-step description of your troubleshooting process when submitting an online warranty request. **NOTE:** On most systems, the VRM is embedded in the system board. Some systems that have two processors also have a discrete VRM. On these systems, you must also remove the VRM when removing the second processor during troubleshooting.
Step 2: Checking the power source, the PSU, and its connecting leads	
Step 3: Reseating and substituting components	
Step 4: Removing installed memory modules	

Troubleshooting Steps for POST Failures

Follow these steps to troubleshoot POST failures:

Click each step to learn more.

Step 1: Removing components	**Step 4** Memory troubleshooting involves: • Swapping the module with a known good module if the POST routine error code information highlights the possibility that the stage failure could be attributed to a memory failure. • Testing the memory in its original modules independently, if multiple sticks are installed, and testing all slots, or substituting with known good modules (preferred). • Checking the status of the LEDs after each action and listening for audible beeps, which are programmed to highlight certain memory events and/or failures. Generally if the system memory is removed and the error code information supports that action, the system board and processor are ruled out as faulty components. **NOTE:** You also need to consider the memory technology, such as DDR1, DDR2, RDRAM and Dual channel, because this impacts on the strategy you employ. Always consult the online and system specific manual, and use online troubleshooting trees if possible.
Step 2: Checking the power source, the PSU, and its connecting leads	
Step 3: Reseating and substituting components	
Step 4: Removing installed memory modules	

Knowledge Check (1 of 2)

True or False: The LED codes displayed during the POST process are directly related to categories of hardware tests.

Make your selection, and click **DONE** when you are finished.

A) True

B) False

Correct!

Knowledge Check (2 of 2)

True or False: To identify a no-POST fault, you check if there is any bootable media in the drives.

Make your selection, and click **DONE** when you are finished.

A) True

B) False

Correct!

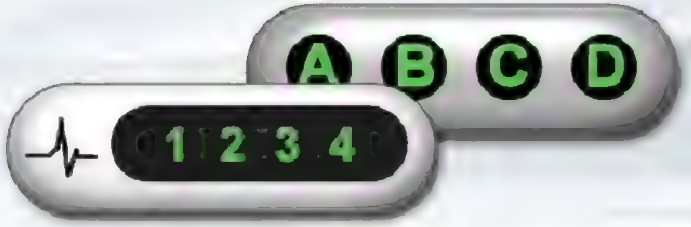
Troubleshooting System Activity Subsequent to Video Initialization

Objectives

The LED code used to signify the system activity subsequent to video initialization type of failure appears quite vague. However, understanding where the code fits in the POST routine and known causes for the error can help clarify these failures.

After completing this topic, you will be able to follow guidelines for troubleshooting system activity subsequent to video initialization.

The 1234 Code



The 1234 or ABCD code is the last pattern displayed on the LED Quad-Pack. This code indicates that the BIOS has relinquished control of the boot process and that the system has completed POST and passed control to the operating system.

Systems that employ the 1234 diag code format will have no Quad-Pack diagnostic lights lit soon after the operating system takes control and POST is complete.

On older systems the completion code is shown as **ABCD**. Because all four LEDs are green, this code may be described as **GGGG**.
Code meaning can vary by system. Refer to the *User's Guide* or *Service Manual* for your system.

The 123 Code

The 123 code appears on the LED Quad-Pack immediately before the 1234 code during a successful boot. If the code remains on the LED Quad-Pack:

The system completed POST but failed to hand over control to the operating system.

An error message probably appears on the display to help you start troubleshooting the boot failure.

On older systems the completion code is shown as **ABC**. Since the first three LEDs are green and the fourth is yellow (amber) this code may be described as **GGGY**.

Code meaning can vary by system. Refer to the *User's Guide* or *Service Manual* for your system.

Troubleshooting the 123 Code

The 123 or GGGY code can appear for a variety of problems ranging from the keyboard to the system board. Start troubleshooting this code by considering the most likely components to cause the issue: an IDE or SATA drive.

Non-bootable media can also cause this error.

Consider the error message on the monitor, if applicable, for confirmation, and then proceed to thoroughly troubleshoot the storage devices.

For example: A system displays the error message **Primary Drive 0 not found, Press F1 to continue, F2 to enter Setup**. The LED Quad-Pack code is 123 because the boot process has been interrupted. To troubleshoot this problem, you could use "No boot" as your support.dell.com search string and focus your troubleshooting on drive-related issues such as corruption or a failure to detect the drive.

Knowledge Check (1 of 2)

In the POST test routine, which of the following code precedes the GGGG?

Make your selection, and click **DONE** when you are finished.

A) GGGY

B) GGGG

C) GGY

D) YGYY

Correct!

Knowledge Check (2 of 2)

What does a 123 LED Quad-Pack code typically indicate? (Check all that apply.)

Make your selection, and click **DONE** when you are finished.

- (A) An error message is probably displayed.
- (B) The hard drive has failed
- (C) The operating system has failed to take control of the computer.
- (D) The system has completed POST.

Correct!

Troubleshooting Display Issues

Objectives

There are various types of displays for Dell Desktop systems. Here, you will learn to identify the display type and review the troubleshooting steps for display issues.

After completing this topic, you will be able to follow guidelines for troubleshooting video issues.

Identifying the Display Type

There are three display types in use. *Click each display type to learn more.*

Note: **CRT** and **LCD** both refer to the technology used to create an image on the screen of the display unit. Although both terms technically refer to a component of the display unit, they are commonly used to refer to the whole unit.

Cathode Ray Tube (CRT)

An older type of display technology similar to an old-type television that uses a large, heavy tube and charged phosphors to render an image.

Flat Screen Monitor

A slightly improved CRT with a flat front glass to reduce distortion of the image.

Flat Panel Display (LCD)

A thin, energy-efficient display with a 1-to-1 ratio of pixels.

Display Troubleshooting Procedure

As with other devices, troubleshooting display issues is a matter of drilling down to the root cause. These factors simplify the process:

- You should never open the chassis of a desktop display unit.
- You are troubleshooting a subsystem, so you have fewer components to check.
- Most displays incorporate some type of self-test.

Troubleshooting Displays

The *User's Guide* or *Service Manual* provide specific information for troubleshooting displays.

Although details can vary by unit, the following steps provide a general troubleshooting procedure:

1. Run the self-test.
2. Test the on-screen display (OSD).
3. Check the settings.
4. Check all connections.
5. Check the video card. *(Not discussed in this topic)*
6. Check the drivers. *(Not discussed in this topic)*

The CRT Self Test

Like computers, most CRTs run a self-test when you power them on. The form of the test and its results can vary widely by CRT.

Always refer to the *User's Guide* or *Service Manual* for your CRT to interpret the results of the test.

Settings

You can adjust the CRT's settings in two places. *Click each to learn more.*

Display Properties Control Panel Applet

The Display Properties Control Panel applet controls how the operating system attempts to communicate with the CRT.

- Resolutions set too high for the CRT to handle may cause an "Out of Scan Range" error to display.
- On older CRTs, setting the resolution or refresh rate too high can burn out the CRT.

On Screen Display

Settings

You can adjust the CRT's settings in two places. *Click each to learn more.*

Display Properties Control Panel Applet

On-screen Display

The CRT's On-screen Display (OSD) is a simple menu to control the CRT's basic internal settings.

- Because CRTs do not necessarily use a one-to-one ratio of resolution to pixels, you can use these settings to force the CRT to display some unsupported resolutions. The results may not appear to be focused.
- If you are troubleshooting a video issue, but the OSD displays correctly, the problem probably stems from drivers or settings in the operating system. If the OSD does not display correctly, the CRT probably has an internal failure and should be replaced.

CRT Connections

Some Dell CRTs were marketed as Multimedia Displays. These CRTs may incorporate embedded speakers, microphones, or connections to speakers and microphones.

Most Dell CRTs have only two connections:

Click each to learn more.

The power cord

Primarily for power issues, you can:

- Make sure the power cord is plugged securely into the CRT and the power source.
- Remove any extraneous points of failure, such as power strips.
- Try a known-good power cord from another CRT or system.

The VGA connection

- Reseat the connection at the video card.
- On most Dell CRTs, the video cable is hardwired to the CRT, so you cannot usually try a known-good video cable.

Troubleshooting LCDs

Support.dell.com and the LCD's *User's Guide* or *Service Manual* provide specific information on troubleshooting LCDs.

Although details can vary by unit, the following steps provide a general troubleshooting procedure:

1. Run the self-test.
2. Test the on-screen display (OSD).
3. Check the settings.
4. Check all connections.
5. Check the video card. *(Not discussed in this topic)*
6. Check the drivers. *(Not discussed in this topic)*

Running the LCD Self-Test

Support.dell.com and the LCD's *User's Guide* or *Service Manual* provide specific information on troubleshooting LCDs. Always refer to the *User's Guide* or *Service Manual* for your LCD for instructions on running and interpreting self-test.

You may also find an LCD's self-test referred to as the **Built-in-Self-test** or **BIST**.

To run the self-test on many LCDs:

1. Power off both the system and the LCD.
2. Disconnect all video cables from the source device, usually the system.
3. Power on the LCD.

Note: Not all inputs may be tested. For example, the Dell 2405FPW UltraSharp Flat Panel does not test for S-Video composite video or component video modes.

Settings

You can adjust the LCD's settings in two places. *Click each to learn more.*

Display Properties Control Panel Applet

Onscreen Display

The Display Properties Control Panel applet controls how the operating system attempts to communicate with the LCD.

Because the LCDs natively use a one-to-one relationship of resolution to pixels:

- Setting a resolution lower than the LCD's native resolution may result in a blurred image.
- Setting a resolution higher than the LCD's native resolution may result in a truncated or scrolled image, depending on how the operating system and the driver interpret the settings.

Settings

You can adjust the LCD's settings in two places. *Click each to learn more.*

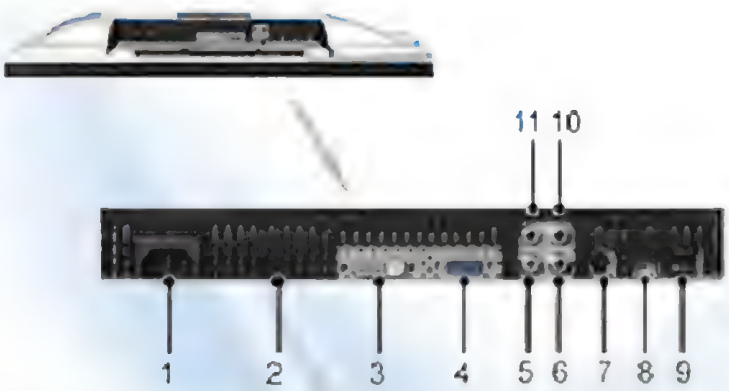
Display Properties Control Panel Applet

Onscreen Display

The LCD's On-Screen Display (OSD) is a simple menu to control the LCD's basic internal settings.

If you are troubleshooting a video issue, but the OSD displays correctly, the problem probably stems from drivers or settings in the operating system. If the OSD does not display correctly, the LCD probably has an internal failure and should be replaced.

LCD Connections



1	AC power cord connector
2	DC power connector for Dell Soundbar
3	DVI connector
4	VGA connector
5	Composite video connector
6	Component video connector – Y
7	S-video connector
8	USB Upstream port
9	USB downstream ports
10	Component video connector
11	Component video connector

Most Dell LCDs have only multimedia inputs and outputs ranging from VGA (-sub) to High-Definition Media Interface (HDMI). Some LCDs also function as USB hubs.

Even though you have more connections to check, the basic troubleshooting procedure remains the same: reseat connections and try known-good cables.

Knowledge Check (1 of 2)

True or False: Setting a resolution too high may cause your LCD to burn out.

Make your selection, and click **DONE** when you are finished.

A True

B False

Correct!

Knowledge Check (2 of 2)

Which type of display usually has multiple inputs?

Make your selection, and click **DONE** when you are finished.

A) CRT

B) Flat screen

C LCD

Correct!

Troubleshooting Heating and Cooling Components

Objectives

Within in a computer, there are components that generate heat and components that dissipate that heat. In this topic, you will learn about those components and some general guidelines for identifying heating and cooling problems.

After completing this topic, you will be able to follow guidelines for troubleshooting heating and cooling issues.

Heating and Cooling Components

Heat issues are commonly misdiagnosed. Some components in a system generate significant heat, whereas other components are designed to help dissipate this heat. Components that generate heat under normal use are:

- Processor
- Hard drive
- Power supply
- Video card
- System board chipset
- Memory

The **processor** is the most prominent source of heat and will always have a cooling solution in place, while other components may not have a cooling solution, depending on the model.

Cooling components include:

- Heatsink
- Fans (processor, power supply, chassis, video card, etc.)
- Thermal pad or grease
- Liquid coolers

A Common Symptom: The Fan Running Too Fast

A common report is that the fan is constantly running fast. This symptom is often misdiagnosed as the fan causing the failure. However, in many cases, the fan running fast is a symptom of a problem, rather than the problem itself. You can verify this by running the Dell diagnostics on the fan and checking to see if it will run at both low and high speeds when tested.

The causes of a fast-running fan are usually related to one of the following:

Heatsink connection to the processor	If the heatsink isn't connected properly, it can cause excess heat buildup on the CPU core, which the system board will detect. As a result, the fan is instructed to spin at a higher rate to compensate. The best way to check this is to follow these steps: 1. Remove the heatsink and clean it off using acetone or a cleaning pad. (NOTE: If acetone is used, be sure to use a lent-free cloth when cleaning). 2. Visually inspect the heatsink for any cracks in the metal, particularly around the connection point to the CPU or any solder points. 3. Reapply the thermal compound or pad and reattach the heatsink to the processor. This will often resolve issues invovling poor connections that result in uneven dissipation of heat.
Temperature sensor on the motherboard	

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The causes of a fast-running fan are usually related to one of the following:

Heatsink connection to the processor	If the fan still spins at a high rate but the system exhibits no other issues of heat-related problems, such as shutdowns or system lockups, and the heatsink has been ruled out, the issue may be the temperature sensor on the system board. The BIOS will monitor the temperature of the CPU and control the fan speed based on this. If the sensor stops reporting, the system will default to a high temperature and will run the fan at full speed as a precautionary measure. This causes the fan to run high without any actual heat buildup.
Temperature sensor on the motherboard	

Heat-Related Issues

If you suspect that you have a heat-related issue, the best first step is to run a hardware diagnostic to test the fans and confirm that they spin as expected. Heat issues may manifest in several ways, such as:

- Random shutdowns
- Restarts
- Lockups
- Kernel errors (blue screen STOP codes)

These symptoms don't always imply a heat-related problem. If heat is the cause of system shutdowns, the system will likely either not power on or not stay on long if powered on immediately after the shutdown, but will stay powered on longer if it is allowed to sit and cool.

Because many components will produce heat by design, it is important to realize that heat-related issues are often not caused by the component creating the heat. Instead, the problem is with the underlying cooling system that is supposed to keep the heat-producing component cooled. Some systems may have hard -drive fans, memory heatsinks, power-supply fans, and/or chipset heatsinks in addition to the processor heatsink and fan.

Note: Never remove the heatsink on the motherboard chipset as this may cause damage or a poor connection when reapplied.

Knowledge Check (1 of 2)

Which components may cause significant heat? (Select all that apply.)

Make your selection, and click **DONE** when you are finished.

- (A) Processor
- (B) System board
- (C) Hard drive
- (D) Heatsink
- (E) Fan

Correct!

Knowledge Check (2 of 2)

True or false: When cleaning a heatsink a lint free cloth must always be used.

Make your selection, and click **DONE** when you are finished.

- (A) True
- (B) False

Correct!

Review (1 of 3)

The fundamental principle and objective of any troubleshooting methodology is **cause** and **effect**. Identify the action (cause) that results in a change (effect) of symptoms or error-code information.

To troubleshoot a suspect power issue, first you need to verify whether the fault is related to **environmental** components.

When troubleshooting **power** issues, try a few simple troubleshooting steps before opening the chassis, such as checking the status of power LED and reseating the power cord.

Power faults can be a result of **failing components.**

To troubleshoot a system that doesn't enter sleep mode, you must determine the cause of the failure by checking these components:

- Applications
- Peripherals
- Operating system settings

Pre-POST failures occur when the system cannot process the software code stored in the BIOS.

Follow these steps to **troubleshoot pre-POST failures**:

1. Check the obvious.
2. Check internal drives, cables, and connection points.
3. Try swapping components with known good components.

Review (2 of 3)

POST failures occur when a component or peripheral fails the POST tests or causes the system to lock up.

Use these sources of diagnostic information to identify the state of the POST failure:

- Power LED
- LED Quad-Pack
- On-screen POST error codes
- Beep codes

Refer to the *User's Guide* or *Service Manual* for your system for the meaning of the reported diagnostic information.

Follow these steps to **troubleshoot POST failures**:

1. Remove the components.
2. Check the power source, the PSU, and its connecting leads.
3. Reseat and substitute the components.
4. Remove the installed memory modules.

The **1234 LED Quad-Pack code** indicates that BIOS has relinquished control of the boot process, and POST processing has completed.

The **123 LED Quad-Pack code** appears immediately before the 1234 code. If the system hangs on the 123 code, the system likely completed POST, but did not hand control to the operating system.

Review (3 of 3)

There are three **display types** in use:

- Cathode Ray Tubes (CRTs)
- Flat screen monitors
- Flat panel displays (LCD monitors)

Never open the chassis of a desktop display unit.

Most display units incorporate a **self-test process**.

Follow these **general steps for troubleshooting displays**:

1. Run the self-test.
2. Test the On-Screen Display (OSD).
3. Check the settings.
4. Check all connections.
5. Check the video card. (Not discussed in this topic)
6. Check the drivers. (Not discussed in this topic)

Adjust **display settings** in two places:

- The Display Properties Control Panel applet
- The On-Screen Display